Exhibit **XX**
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FLATHEAD NATIONAL FOREST

EVALUATION AND COMPLIANCE WITH NATIONAL FOREST MANAGEMENT ACT REQUIREMENTS TO PROVIDE FOR VIABILITY AND DIVERSITY OF ANIMAL COMMUNITIES

Updated February 2017

Project Review by:

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INTRODUCTION

The 1982 regulations implementing the National Forest Management Act (NFMA) require National Forests to manage habitat in order "to maintain viable populations of existing native and desired non-native vertebrate species in the planning area" (36 C.F.R. 219.19). In addition, all management prescriptions shall "Provide for and maintain diversity of plant and animal communities to meet overall multiple-use objectives" (36 C.F.R. 219.27).

The Forest Service's focus for meeting the requirement of NFMA and its implementing regulations is on assessing habitat conditions based on local information and knowledge, best available science, and/or habitat models to provide for diversity of animal communities. This document considers the existing environmental situation of federally listed endangered and threatened species, sensitive wildlife species, commonly hunted big game species, Neotropical migratory birds, and wildlife using old growth and snag and downed wood habitats to provide additional information to evaluate FNF's compliance with NFMA requirements.

Federally listed endangered and threatened species are those in danger of extinction throughout all or a significant portion of its range or are deemed likely to become an endangered species within the foreseeable future, respectively. The Forest Service must conduct a biological assessment for the purpose of identifying any endangered species or threatened species which is likely to be affected by an action. In addition, the Endangered Species Act of 1973 (ESA) directs the Fish and Wildlife Service to identify recovery goals that would, when met, allow a given listed species to be de-listed. While the language in ESA does not equate recovery with viability, it is assumed that the first needed step in maintaining long-term species viability is meeting the recovery goals that would allow a species to be removed from the list.

Sensitive wildlife species are those animal species identified by the Regional Forester for which population viability is a concern. Forest Service policy (FSM 2670.32) is to review programs and activities, through a biological evaluation as part of the NEPA process, to determine their potential effects on sensitive species. Adverse impacts to species whose viability has been identified as a concern should be avoided or minimized. A strategy typically used by Region 1 to assure that viability requirements are met for sensitive species involves the review of available literature, known population and habitat information, and evaluations of known or modeled habitats.

The Flathead National Forest (FNF) Forest Plan (USDA-FS 1986 as amended) lists as *Management Indicator Species* (MIS) all threatened and endangered species, sensitive species, and commonly hunted big game species. These represent the habitat associations of wildlife MIS of the FNF that are shown below in Table 1. The Amendment 21 Decision that listed these as MIS also stated that it was appropriate to focus limited resources on programmatic efforts to evaluate and monitor the effects of management actions on the habitat of those species for which population viability is a particular concern. Species have been monitored on the FNF and reports on their status in this document, which is updated periodically. The FNF also publishes a Forest Plan Monitoring and Evaluation Report, the most recent being for Fiscal Years 2008 to 2010 (USDA-FS 2010). In some cases monitoring has been conducted by the Forest Service and in other cases monitoring has been conducted by research scientists or personnel from other agencies and private organizations. The sources of monitoring data are identified in the sections which follow. The sections below also list relevant FNF Forest Plan monitoring items for which results are available on-line (USDA-FS 2010; http://www.fs.usda.gov/main/flathead/landmanagement/planning). The current effort to revise the FNF Forest Plan also produced an "Assessment of the Flathead National

Forest" (USDA-FS 2014), designed to evaluate and present existing information about relevant ecological, economic, and social conditions, along with trends and sustainability.

The MIS approach is one means of evaluating the effects of management, in that their population trends are assumed to reflect changes in habitat quantity and quality due to management. Such species are often selected for analyses when it is not feasible to address the life requisites of all species potentially found on a given landscape, such as a national forest (Wiens et al. 2008, Lambeck 1997). These approaches work best at broad management scales when management objectives are to conserve a large number of species or represent broad biodiversity issues (Wiens et al. 2008). Although there is support in the literature for such a multi-species assessment approach, one criticism is "the assumption that providing for life history requisites of a few carefully selected species will result in the conservation of most species in a given project area. Some authors contend that the relationships between surrogate species, target species, and ecosystem attributes are extremely complex, and hence such approaches are unreliable (Lindenmayer et al. 2002, Caro et al. 2005, Caro and O'Doherty 1998)" (in Nutt et al. 2010). Population data, projected trends, and cause and effect relationships are difficult to determine with confounding variables such as intermixed ownership, variable land histories, fires, climate change, and off-forest effects. Cushman, et.al (2010) did not show any strong relationship that one species could be used as a surrogate for others. Nevertheless, another theory suggests that habitat changes at the local level would be expected to change population capacity.

CURRENT SITUATION

The FNF land area is close to 2,392,800 acres (USDA-FS 2016c) or 3,750 square miles. Most of it is in large blocks of uninterrupted, contiguous NFS lands, although there are isolated tracts of private lands surrounded by NFS lands. In addition, some FNF lands are isolated tracts surrounded by private lands and by large blocks owned by corporate landowners. Encircled by the Kootenai, Lewis and Clark, and Lolo National Forests, Glacier National Park, and Canada, the FNF is the heart of the northern Rocky Mountain ecosystem.

About 69% of the FNF is designated wilderness, recommended wilderness, or inventoried roadless area, with large habitat blocks that are relatively undisturbed by humans. These areas, in concert with other special areas such as Wild and Scenic river systems, Research natural Areas, and other undeveloped backcountry areas, provide habitat strongholds for a host of plant and animal species.

Forestwide, there are 3,566 miles of Forest Service System roads, of which 40% are open to public motorized use either yearlong or seasonally (USDA-FS 2016c). The total road density is low, at 0.95 miles of road per mi^2 of land. The open road mileage averages 0.4 miles of road per square mile of land. These roads along with about 2,200 miles of trails provide access to FNF for a variety of uses, resource management, and activities such as providing forest products for commercial and personal use, developed and dispersed recreation throughout all seasons, maintenance of forest roads and trails, livestock grazing, and special use permits for roads, recreation facilities, utilities, and other approved uses. Since 1995, approximately 1.6 miles of permanent road construction has occurred per year while approximately 29 miles of roads have been decommissioned each year (USDA-FS 2016c). Over 400 miles were added due to the acquisition of previously Plum Creek Timber Company lands located in the Swan Valley. Annual maintenance occurs on about 25% of the roads across FNF, although about 75% of roads suitable for passenger cars are maintained each year. Many miles of road with other access restrictions (barriers such as gates) add to increased acreages and improvements to wildlife habitat security. Monitoring of these closures is reported annually in the Amendment 19 monitoring report (USDA-FS 2016a).

Approximately 22% of FNF lands are classified as "suitable for timber production", which excludes non-forest lands, wilderness, inventoried roadless, and other areas that were found to have other resource concerns that would preclude timber production as an objective (USDA-FS 2016c). When consistent with other management direction, timber harvest is allowed on another 19% of FNF lands for purposes such as timber salvage, fuels management, insect and disease mitigation, and protection or enhancement of wildlife habitat, although this harvest is not scheduled to occur on a rotation basis (USDA-FS 2016c). Approximately 72,000 acres, or about 3%, of FNF lands, have been regeneration harvested over the past 25 years, creating early successional forest (USDA-FS 2016c). Since 1980, commercial timber harvest has been relatively steady since 1980, occurring on an average of 5,660 acres of the FNF each year with 68% of this as regeneration harvest (based on information in USDS-FS 2014). The total area treated is expected to be 3,000 to 5,000 acres per year, or 0.13% to 0.21% of FNF land area. An analysis of vegetation composition, structure, and landscape pattern on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 2008-2010, monitoring item #68, USDA-FS 2010) reported on changes in vegetation since the time of the Amendment 21 analysis in 1999. From a Regional perspective, Samson (2005) reported Northern Region timber harvest in 2004 amounted to 0.09% of National Forest System lands in Region One.

In the past twenty five years, a large amount of area on the Flathead has burned in wildfires (over 400,000 acres, or about 17% of FNF), mostly high-severity burns (USDA-FS 2016c). This has ranged from 4 to 24% by subbasin (USDA-FS 2010). Salvage of fire-killed trees occurred across approximately 10% of the acres burned from 1990 to 2013 (USDA-FS 2014), representing less than 0.7% of the FNF. Prescribed fire has been used on approximately 13,200 acres (0.5%) of the Flathead NF since 2002 (USDA-FS 2014). This is included in the 22,463 acres of non-timber harvest fuel-reduction activities that have taken place on FNF from 2001 to 2012. Past fire suppression has created large landscapes where the coniferous canopy appears natural, but if they had been left to their natural fire regime they would likely have more natural openings and a more diverse plant species composition (USDS-FS 2014).

Recreation is another activity that occurs on large areas of the FNF. An estimated 885,000 people visited the FNF in 2010 and this number is expected to continue increasing (USDA-FS 2016c). There are 80 developed recreation sites, predominantly campgrounds, boating sites, lookouts/cabins, and improved trailheads, but with smaller numbers of sites for fishing, picnicking, swimming, or interpretation. There are two downhill ski areas and one cross-country ski area. Motorized over-snow vehicle use is suitable on about 31% of the FNF. Wheeled motorized use is allowed on close to 10% of the 2,200 miles of trails.

Other uses are varied and occur over relatively small areas of land (USDA-FS 2016c). The FNF currently administers 563 special-use permits, of which 142 are for recreation ranging from short-term outfitter/guide permits to the downhill ski resorts. Other permits include driveways, powerlines, oil and gas pipelines, communications towers, research studies, fences, signs, and service buildings. Four airstrips are available for public use. Special forest products, including firewood, Christmas trees, huckleberries, transplants, and mushrooms, are gathered from FNF lands for personal use or sale. Gravel and rock are removed from relatively small pits and quarries as well as by free use permits. Just over 1,400 Animal Unit Months of cattle grazing is authorized (as of 2014), occurring across 3% of the FNF. There are no sheep grazing permits on the FNF.

Diverse ecosystems on the Flathead National Forest support close to 300 species of wildlife. These species are largely associated with the following habitats:

- Aquatic, wetland, and riparian habitats
- Hardwood tree habitats
- Cliff, cave, and rock habitats
- Grass, forb, shrub habitats
- High elevation habitats including persistent spring snow
- Coniferous forest habitats and their connectivity
- Old growth, late successional forest, and very large live and dead trees
- Dead trees less than 20 inches d.b.h., including burned forest

Redundancy, resiliency and representation of habitat for species occur on the FNF by following the conservation biology principles that provide for sustainability of species. These conservation principles are applied during project and program planning and implementation. As explained further in the *Terrestrial Species and Climate Change* section of this document, 1) Wildlife species are well-distributed across their range and are less susceptible to extinction; 2) Habitat is in large contiguous blocks and not fragmented by high road density; 3) Large blocks of habitat contribute to less fragmentation of populations and act as connectors or corridors across the landscape; 4) Blocks of habitat are close together and experience more interchange of individuals due to the land acquisition program, access management for grizzly bears, and management of wilderness and roadless areas; 5) Interconnected blocks of habitat provides the opportunity for species to move between patches that contain suitable habitats with less vulnerability with FNF well connected with Canada, Glacier National Park, and the Kootenai, Lewis and Clark, Helena, and Lolo National Forests, as well as the Flathead Indian Reservation Wilderness and forest lands, and forest matrix of state and private industrial forest lands; and 6) Much habitat is in areas where the direct or indirect effects of human disturbance are low in order to provide for habitat security.

The Flathead National Forest is in the process of revising its 1986 Land and Resource Management Plan, in compliance with the 2012 planning rule (36 CFR § 219.17(3)(b)(1)). This rule requires that plans use a "complementary ecosystem and species-specific approach to provide for the diversity of plant and animal communities and to maintain the persistence of native species in the plan area. Ecosystem plan components would be required for ecosystem integrity and diversity, along with additional, species-specific plan components where necessary to provide the ecological conditions to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain viable populations of 'species of conservation concern'" (USDA, 2012, p. 21169).

As of November 2016, six wildlife species were listed as potential Species of Conservation Concern (SCC) on the Flathead National Forest by the Regional Forester (USDA-FS 2016c). These species are Black swift (Aquatic, wetland, and riparian habitats); Clark's nutcracker (Coniferous forest habitats); Fisher (Old growth habitat and very large live and dead trees); Flammulated owl (Coniferous forest habitats); Harlequin duck (Aquatic, wetland, and riparian habitats, and cold, fast-moving rivers and streams); and Townsend's big-eared bat (Rock, cliff and cave habitat). SCC are known to occur in FNF's plan area and the Regional Forester has determined that the best available scientific information indicates concern about the species' capability to persist over the long-term in the plan area (36 CFR 219.9) (USDA, 2012, p. 21169) (see table 29). More information about the Northern Region SCC can be found at http://www.fs.usda.gov/detail/r1/landmanagement/planning/?cid=fseprd500402.

Also for the Forest Plan revision, several species were deemed to be of "Public Interest", worthy of in-depth analysis. As of November 2016, these are the Bald eagle, Beaver, Boreal [Western] toad, Common loon, Northern bog lemming (Aquatic, wetland, and riparian habitats); Mountain goat, Peregrine falcon (Cliff, cave and rock habitat); Elk, Gray wolf, Marten, Moose, Mule deer, Northern goshawk, White-tailed deer (Coniferous forest habitats in a variety of successional stages); Pileated woodpecker (Old growth habitat, very large live and dead trees); and Black-backed woodpecker, Olive-sided flycatcher (Burned forests and dead trees and dead trees less than 20 inches dbh).

Based on these figures and situations, the level of timber management, fuel management, other forest uses, resource management activities, and on-going activities does not necessitate reevaluating the findings in this document for each site-specific project occurring on FNF. The validity of this document will be evaluated annually or after major wildfire events for appropriate best science, edits, assumptions, and evaluations.

Documents incorporated by reference include the Region's *Conservation Assessment of the Northern Goshawk, Blacked-Backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region, USDA Forest Service* by Samson (2005 updated 9/2/08) and *Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Blacked-Backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten and Fisher*, by Samson (2006), which are unpublished reports on file.

Table 1. Current Situation and Habitat Associations of Flathead National Forest Terrestrial Wildlife Species Evaluated for Diversity and Viability

Montana Field Guide. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks, http://fieldguide.mt.gov/. Retrieved on November 25, 2016.

Common Name	Flathead Nat. Forest Residence	Global and State Ranks (MTNHP 2016)	Grass/ Forb	Seedling/ Sapling/ Shrub	Pole	Med. Single-story	Med. Multi-story	Large Single-story	Large Multi-story	Aspen/ Cotton-wood	PP DF WL	GF WL WRC	LPP	SAF DF S	WBP AL	Special Habitats
Threatened:																
Canada Lynx	Permanent	G5, S3, SOC	- f -	- F -				B - R	B - R	X		X	X	X	X	Log
Grizzly Bear	Permanent	G4, S2S3, SOC	- F -	B F R	b f r	b f r	b f r	b f r	b f r	X	X	X	X	X	X	Talus, log
Sensitive:																
Bald Eagle	Migrant	G5, S4, SSS				- F r	- f r	B F R	B F R	X	X	X				Snag, lake, river
Bighorn Sheep	Transitory	G4, S4	F – R	- f -				- f-r		X	X				X	High elevation, cliff
Black-Backed Woodpecker	Permanent	G5, S3, SOC		- f -		b f r	b f r	B F R	B F R		X	X	X	X		Post-fire
Boreal (Western) Toad	Permanent	G4, S2, SOC	- f r							X	X	X				Lake, river, log
Common Loon	Migrant	G5, S3B, SOC	B – R													Lake
Fisher	Permanent	G5, S3, SOC			- f -	- f -	- f -	B F R	B F R	X		X	X	X		Log, snag, riparian
Flammulated Owl	Migrant	G4, S3B, SOC	- F -	- F -				B F R	b f R	X	X	X				Snag, open forest
Gray Wolf	Permanent	G4, S4 (delisted)	B F -	b F r	b f r	b f r	b f r	b f r	b f r	X	X	X	X			
Harlequin Duck	Migrant	G4, S2B, SOC	B – r						B - -							Riparian, river, log
Northern Bog Lemming	Permanent	G5, S2, SOC	B F R	b f r					b f r			X				Marsh
Northern Leopard Frog*	Permanent	G5, S1, SOC	- - r							X						Lake, river
Peregrine Falcon	Migrant	G4, S3, SOC (delisted)	- F -	- f -				- f -		X	X		X		X	Cliff, riparian
Townsend's Big-Eared Bat	Migrant	G4, S3, SOC	- f -	- f -	- f -	- f -	- f -	B - R	B - R		X	X	X	X		Cave, snag
Wolverine	Permanent	G4, S3, SOC	- f -	- f -	- f -	b f r	b f r	b f r	b f r	X	X	X	X	X	X	Persistent Spring Snow ,
Commonly Hunted:																
Elk	Permanent	G5, S5	- F -	b F r	b - r	b - r	b - R	b f r	b - R	X	X	X	X	X	X	
Mule Deer	Permanent	G5, S5	- F -	B F R	B f r		b f R		b f R		X	X	X	X	X	
White-tailed Deer	Permanent	G5, S5	- F -	b F r	b f r	b f r	b f r	b f r	B F R	X	X	X	X			Riparian
Other:																
Boreal Owl	Permanent	G5, S3S4, PSOC	- F -	- f -			b f r	B f R	B f R	X		X	X	X	X	Snag, forest mosaic
Northern Goshawk	Permanent	G5, S3, SOC	- F -	- f -				B F R	B F R	X	X	X	X	X		Log

* Does not occur on FNF lands.

Habitat Use Codes: B = suitable for breeding, b = marginal for breeding, F = suitable for feeding, f = marginal for feeding, R = suitable for resting, r = marginal for resting.

Tree Species Codes: PP DF WL = Ponderosa pine, Douglas-fir, Western larch; GF WL WRC=Grand fir, western larch, western redcedar; LPP = Lodgepole pine; SAF DF S = Subalpine fir, Douglas-fir, spruce; WBP AL = Whitebark pine, alpine larch.

Natural Heritage Program Rank: G = Species range-wide (Global); S = State wide (or western Montana if different); 1 = At high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state. 2= At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state. 3 = Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas. 4 = Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. 5 = Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range. B = State rank modifier indicating breeding for a migratory species. PSOC = Montana Potential Species of Concern. SOC = Montana Species of Concern. SSS = Special Status Species.

BALD EAGLE *(Haliaeetus leucocephalus)*

The bald eagle is a Management Indicator Species on the Flathead National Forest (FNF). Among other species and habitats, this eagle is an indicator that the needs of other species that use open-canopy lower montane and montane forests are met, particularly those associated with lakes and rivers. In Montana, the bald eagle was removed from the Endangered Species list in August of 2007. As of 2009, Montana had an estimated 526 bald eagle territories and targets for individual recovery zones were exceeded by 4 to 7 times. In 2010 and 2011 the bald eagle had large population increases and robust productivity. The population continues to increase, with over 600 known territories, and nesting birds are starting to occupy areas that were previously considered to be marginal habitat at best (Dubois 2012). Well distributed across lower-elevation areas, as of 2009 there were 12 active bald eagle nest territories on or adjacent to the FNF. There has been a steady increase in the number of statewide territories, from 1980 to 2012 (Figure 1), with the average on FNF at about nine territories per year (Table 2a, 2b).

Natural History

In Montana, bald eagles nest in stands containing large trees (typically greater than 30 inches DBH) in forests with uneven canopy structure and in direct line of sight of a large river or lake that is generally less than one mile away (Montana Bald Eagle Working Group 1994). Bald eagles prey on fish, waterfowl, and small mammals; steal food from other predators; and scavenge carrion. During the breeding season, important foraging habitat is usually less than ten miles from their nest. Some eagles stay in the general vicinity of the nesting area while others may wander or migrate up to hundreds of miles to wintering grounds (USDI-FWS 2006b).

Population, Habitat, and Distribution

The bald eagle population in the lower 48 States has increased from approximately 487 active nests in 1963, to an estimated minimum 7,066 breeding pairs today (USDI-FWS 2006). The FNF is in the Pacific States Bald Eagle Recovery Area (USDI-FWS 1986) and the Upper Columbia Basin Zone (Zone 7). The Bald Eagle Recovery Team recommended a set of criteria to measure recovery that included among other items a minimum of 800 nesting pairs in the 7-Western State Area (Montana Bald Eagle Working Group 1994). The number of nesting pairs in the Pacific States exceeded the recovery goal of 800 in 1990, and has continued to increase to approximately 1,627 nesting pairs by 2001 (USDI-FWS 2006). In the 1986 Recovery Plan, the recovery goal for de-listing eagles in Montana was 99 breeding pairs (USDI-FWS 1986).

There is a statewide effort to monitor bald eagle nests annually. Some nests are difficult to monitor nest occupancy and production without the aerial observance. Across Montana in 2010, there were 557 bald eagle territories, of which 381 were known to be occupied (Table 2a) (Dubois 2012).

Montana's nesting population continues to increase (Figure 1) well beyond predicted carrying capacity (Hammond 2010). Average production for the state was excellent with a mean brood size of 1.42 fledged/successful nest; 81.5% nesting success for 286 known fate active nests; and an estimated number of young fledged, based on 347 active nests: 402 young (Dubois 2012).

Table 2a. Observed Bald Eagle Population Information for Montana for 2010.

Zone	Current Territories	Monitored	Occupied	Active	Unknown Outcome	Unsuccessful	Successful	# Fledged
007	242	180	174	164	18	33	113	190
018	21	4	4	2	1	0	1	1
038	53	44	43	37	10	2	25	47
039	75	79	79	76	19	5	52	7
040	69	10	9	9	8	0	1	1
041	73	58	58	45	5	6	34	73
047	24	14	14	14	7	7	7	13
Total Observ	557	389	381	347	68	53	233	332
Total Est.				347		64	283	402

The FNF is in Montana's Zone 7 (Dubois 2006). In 2010, 180 of the 242 known nests in Zone 7 were checked, revealing 77% (113/113+33) nesting success for known fate active nests and a 69% nesting success rate of those active nests, with 190 eaglets produced. On or adjacent to FNF are 10-13 active nest territories. In 2010, 6 nests were occupied with 9 young produced. Table 2b shows the 28-year average of monitoring bald eagle nests on or near the FNF, albeit monitoring efforts some years were less extensive than others.

Figure 1. Montana Bald Eagle Nesting Territories: # per year from 1980 to 2009 (DuBois 2012).

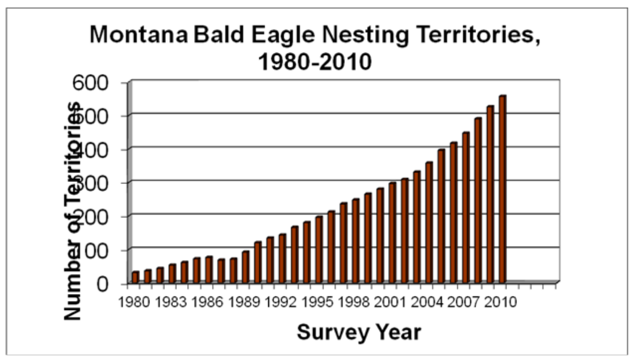


Table 2b. Bald eagle nest monitoring results from 1980 to 2010 on or near the Flathead NF

	Total Territories	Active Territories	Number of Successful Nests	Total Young Produced	Young per Successful Nest
Average	9.32	7.45	5.19	7.26	1.40

Historically, bald eagle habitat in and near the FNF was probably much as it exists now, except that many areas of nesting habitat apparently had relatively frequent low-severity ground fires with occasional large, stand-replacing crown fires. It was probably rare for any potential territory to not encompass some nesting habitat within one mile of its associated water body. Bald eagle nesting and foraging habitat conditions in the area appear to be stable. Larger lakes and rivers that don't freeze, plus areas with carrion, continue to provide winter food in and around the Flathead River basin. Population growth has been attributed to the substantial reduction of environmental contaminants, habitat protection, and management actions (USDI-FWS 2006).

Montana's state rank for the bald eagle is S4, "Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining." The bald eagle is listed in Montana as a Species of Special Concern and is no longer on the Montana Species of Concern (SOC) due to large population increases and robust productivity (Dubois 2012).

Threats

One of the greatest threats to bald eagles was the high level of persistent organochlorine pesticides (such as DDT) occurring in the environment. Recreation activities that may affect bald eagles include boating, fishing, hiking, camping, hunting, and cycling. Building some of the campgrounds and other facilities probably prevented future nesting on some shores. Timber harvest, underburning, and other vegetation manipulation can impact current and potential nesting habitat by removing nest trees and screening cover. Away from their nests, bald eagles are most likely to feel the effects of timber harvest and insect epidemics through indirect effects on their food sources, such as through changes in habitat quality for an aquatic prey species. Disturbance of eagles may increase and the availability of perch or roost trees or security near foraging sites may decline. Stand-replacing fire spreading to nest stands can eliminate potential nest trees and associated live vegetation and perches. Understory fires can create snags used for nesting or perching and can increase the chances that a forested stand would persist. Additional threats may be lead poisoning from scavenging carrion, agricultural practices, energy development or from vehicles while scavenging roadside carrion.

Conservation

The protection available under the ESA and the banning of DDT and other harmful chemicals resulted in significant increases in the breeding population of bald eagles throughout the lower 48 States (USDI-FWS 2006). In response to the increasing population, the FWS published an advanced notice of a proposed rule on February 7, 1990, (55 Fed. Reg. 4209) to reclassify the bald eagle from endangered to threatened in the remaining 43 States where it had been listed as endangered and retained threatened status for the other 5 States. On July 12, 1994, the FWS published a proposed rule to accomplish this reclassification (59 Fed. Reg. 35584), and the final rule to down-list the species was published on July 12, 1995, (60 Fed. Reg. 36000). Populations of bald eagles continued to increase, and on July 6, 1999, the FWS published a proposed rule to de-list the bald eagle throughout the lower 48 States due to recovery (64 Fed. Reg. 36454). The best available scientific and commercial data indicate that the bald eagle has recovered. Therefore, under the authority of the Endangered Species Act of 1973, as amended (Act), the USDI-FWS, removed (delisted) the bald eagle in the lower 48 States of the United States from the Federal List of Endangered and Threatened Wildlife as of August 8, 2007 (USDI-FWS 2007c), except the Sonoran Desert population of central Arizona, which remains listed.

The bald eagle is now a Forest Service Sensitive Species. Forest Service policy (FSM 2670.32) is to review programs and activities, through a biological evaluation as part of the NEPA process, to determine their potential effects on sensitive species. Adverse impacts to species whose viability has been identified as a concern would be avoided or minimized. The Montana Bald Eagle Management Plan (Montana Bald Eagle Working Group 1994) developed specific direction for recovery to non-listed status and has been used by FNF for project analysis. An addendum to the 1994 plan was produced in 2010 by the Montana Bald Eagle Working Group (Montana Bald Eagle Working Group 2010). Bald eagles are still legally protected from "take" under the Migratory Bird Treaty Act (1918), the Bald and Golden Eagle Protection Act (BGEPA 1940), and the Lacey Act (1901). Lastly, the USDI-FWS has published the National Bald Eagle Management Guidelines (72 FR 31156; June 5, 2007) that are to be used in conjunction with a new definition of the term ''disturb.'' The Guidelines are intended to: (1) Publicize the provisions of the BGEPA that continue to protect bald eagles, in order to reduce the possibility that people will violate the law; (2) advise landowners, land managers, and the general public of the potential for various human activities to disturb bald eagles.

As described in Hammond (2010), "Healthy bald eagle populations in Montana can only be maintained through proactive conservation and management strategies that provide the suite of habitat components necessary for eagles. This includes current, alternate, and suitable nest territories as well as important winter, migration, and foraging habitat."

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. FNF LRMP standards, such as protection of existing old growth, retention of higher densities of snags, and emphasis on restoration of fire as an ecological process benefit this species. Forest Plan direction includes pages II-23 #5; III-53 #2, 3; and III-83 #6, Amendments 8, 11 and 13. Other actions taken on the FNF include application during project development and implementation of the Montana Bald Eagle Management Plan specific direction and guidance for recovery. Public education focused on bald eagles has been used on the FNF since at least 1988. Cooperative bald eagle annual monitoring and surveying for breeding pairs and locations of nests (MFWP 2005) will continue to occur.

The Post-delisting Monitoring Plan (USDI-FWS 2009d) will continue to monitor the status of the bald eagle by collecting data on occupied nests over a 20-year period with sampling events held once every 5 years.

<u>Evaluation of Current Situation on NFS Lands</u>

Summary for the bald eagle and its habitat:

- Found throughout FNF, state and widely dispersed across North America.
- Nesting population in the state continues to grow.
- Has been delisted as a federally threatened species as of August 2007.
- Two pieces of federal legislation still provide protection for this species, the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.
- Is a Forest Service Sensitive Species and a review of programs and activities occurs through a biological evaluation to determine their potential effects on sensitive species.
- The greatest threat to the population, organochlorine pesticides, has been removed from use,
- Eagle habitats on FNF lands are protected by riparian management direction and application of the Montana Bald Eagle Management plan.

- Participation in statewide annual surveys, and the FNF information and education program, provide direction and conservation for this species.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.

22a. Acres of potential habitat available for bald eagle nesting.
22b. Number of bald eagle nesting territories and annual productivity.

23. Number of Nest Management Plans completed for bald eagles and peregrine falcons.
26. Fish Habitat; Need for Fish Habitat Improvement
29. Fish Habitat; Water Temperature
45. Change in Water Quality
46. Water Yield Change from Timber Harvest
47. Sediment Yield
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Other factors outside of the Forest Service's control (i.e. wintering areas) may have negative effects on the bald eagle. Based on the above analysis, management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the bald eagle and not lead to a trend toward federal listing. The species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

BIGHORN SHEEP *(Ovis canadensis)*

The bighorn sheep became a Forest Service Sensitive Species in Region 1 and on the Flathead National Forest (FNF) in May 2011. From the late 1800s through the mid-1900s, bighorn sheep populations experienced significant declines across their range as a result of disease die-offs introduced from domestic sheep and transmission of pneumonia pathogens, unregulated and market hunting, habitat loss, and competition from domestic livestock. In the 1960s, many western states began active bighorn sheep transplant programs in an effort to augment small, remnant sheep populations and to reintroduce bighorns into historic, but vacant, habitat. Only three transitory herds are known on FNF in fairly remote locations. Bighorns generally occupy steep mountain slopes and rock outcrops. There appears to be little risk of population loss and the FNF should maintain the transitory populations where the capability of the natural habitat permits.

<u>Natural History</u>

Bighorn sheep in Montana are adapted to a wide variety of habitats (MFWP 2010) with three elements essential to quality bighorn habitat. These elements are degraded by plant succession or human induced activities. As discussed within (MFWP 2010) these elements are: 1) Escape cover or terrain is a common element in all seasonal habitats. Bighorn sheep, especially ewes, are generally found within 100 to 300 m of escape terrain. In agreement with past bighorn sheep habitat studies Decesare and Pletscher (2006) found slope and distance to escape terrain were important habitat variables across seasons and sites. Escape terrain is comprised of slopes 60% or greater with occasional rock outcroppings with adjacent open foraging areas. Areas with dense timber tend to receive little use except in areas in the Northwest Montana where bighorns have adapted to timbered habitats. 2) High visibility in all bighorn habitats is recognized by most biologists as being highly important in the detection and avoidance of predators as well as access to forage and foraging efficiency. 3) Winter range areas tend to be low elevation, south-facing slopes with escape cover in proximity to foraging areas. Winter range is defined as all escape terrain, which receives less than approximately 10 inches of snowpack. Smith et al. (1991) identified core habitat based on escape terrain patches and subsequently removed areas from this core habitat that were unsuitable for other reasons (e.g., dense vegetation, close proximity to human development, close proximity to domestic sheep, high elk or cattle concentrations, etc.).

Many sheep herds consist of small numbers (often less than 100 animals while many biologists consider herds with less than 200 animals at risk due to extrinsic factors), are isolated from adjacent sheep populations (sometimes by large expanses of unsuitable habitat), and because many are threatened by disease transmitted from domestic livestock (Berger 1990, Krausman et al. 1993, MFWP 2010). Species with specialized habitat requirements often are segregated into disjunct subpopulations because of both natural and anthropogenic fragmentation of suitable habitat. In the spectrum of large herbivores, bighorn sheep provide a good example of such a species (Bleich et al. 1990). As such MFWP (2010) has developed individual management plans for each population, habitat and population objectives, and strategies for meeting those objectives.
Some individual animals can disperse from their herd and will sometimes cross large areas and intermountain valleys looking for new suitable habitat. Decesare and Pletscher (2006) cautiously suggest that distinct populations of Rocky Mountain bighorn sheep may be more connected than previously known. They observed movements of 12-20 miles of males. If so, connectivity can create an efficient path for disease spread. It remains unclear whether connectivity among populations serves as a genetic boost or a disease-laden liability.

Population, Habitat, and Distribution

The bighorn was historically distributed from the Canadian provinces of British Columbia and Alberta south to Mexico. With the exception of the bison, the bighorn remains the native ungulate in Montana with the most reduced numbers and range that has not recovered from the dramatic population declines of the 1800s. Buechner (1960) reported Montana having only 17 isolated populations. With the help of transplants the numbers prior to a 2009-10 die-off had risen to an estimated 5,700 bighorn sheep in 45 distinct populations in 2008 (MFWP 2010). The 2010 die-offs contributed to a statewide decline of over 10 percent over a short time period, indicating the volatility of the situation and the vulnerability of individual and separate populations. Preliminary surveys indicate that in all but one of the populations with die-offs, lamb survival through mid summer is between zero and “very low” (personal communication, Tom Carlsen, MFWP 2010). In 2010 Forest Service Regional Office personnel communicated with other state wildlife agencies and heritage programs that indicated individual population trends vary greatly and include slowly increasing, stable, slowly decreasing, and rapidly decreasing. Idaho currently has about 2,700 bighorns statewide, with pre-European settlement numbers estimated at 100,000 (personal communication, Dale Toweill, IDFG). Bighorn numbers statewide have declined by approximately half since the 1980s. North of the Snake River numbers have declined from 3,850 in 1990 to less than 1900 currently. North Dakota has 350 bighorns, with 90% spending the majority of their time on R1 lands (personal communication, Brett Wiedmann, NDFG). South Dakota has approximately 450 bighorns (personal communication, John Kanta, SDGFP), with recent declines in the Black Hills population, and with sightings but no recognized or managed populations on R1 lands.

There are no resident herds on the FNF. Bighorns believed to be resident in surrounding areas are sometimes seen on the FNF. Members of the Sun River herd (residents on the Lewis and Clark NF) are occasionally observed in the Bob Marshall Wilderness on the FNF in the Whitcomb Peak, Scarlett Mountain, and Haystack Mountain areas. Twelve bighorns were observed on Haystack Mountian during the 2010 summer. Individuals from a Glacier National Park herd are occasionally observed in the Challenge-Skyland area of the Middle Fork Flathead River on the FNF. Members of the Ten Lakes Herd (resident on the Kootenai NF and into Canada) are occasionally observed in the area from Mount Thompson Seton to Tuchuck Mountain on the FNF. These three bighorn populations are relatively stable but may be susceptible to periodic die-offs due to disease (MFWP 2010). As a big game species bighorns are monitored by MFWP. In Montana the bighorn sheep has a state ranking of S4, "Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining."

Threats

There are three major issues concerning the management of bighorn sheep habitats on public lands in Montana (MFWP 2010). The issues are: 1) livestock management on seasonal bighorn sheep habitat, 2) forest succession or the encroachment of conifers into former grassland or shrub grassland habitats, and 3) the influence of noxious weeds on the vegetation resource.

Both cattle grazing (competition for forage and displacement) along with sheep grazing (risks of contact and disease transmission) affect bighorns. Domestic sheep are host to pathogens for which bighorn sheep have little or no immunity (MFWP 2010). The decline of bighorn sheep in the late 1800s is thought to have occurred largely because of the introduction of domestic sheep (Buechner 1960). The primary risk factor for bighorns is all-age epizootic dieoffs, generally associated with interactions with domestic sheep (although domestic goats may also be carriers). This risk is greatly exacerbated by the fact that domestic and wild sheep are attracted to each other, and can actively seek each other out over great distances. There are no sheep allotments on the FNF and no cattle grazing occurs near known locations of bighorns. There are 21 open active domestic sheep allotments on NFS lands in R1 on the Beaverhead Deerlodge, Helena, and Nez Perce NFs, and the DPG. There are four additional vacant allotments on the Lewis and Clark NF.

Arno and Gruell (1986), in studying conifer encroachment in mountain grasslands, concluded that since 1890, when major fires across the West decreased as a result of excessive livestock grazing, fire suppression efforts, and cessation of ignitions by Native Americans, conifers has become established in former grassland vegetation types. The importance to bighorn sheep of escape terrain and open habitats with good visibility and acceptable forage has been well documented by many biologists and forest succession has been a major cause of habitat loss for bighorn sheep (MFWP 2010). FNF often allows wildfire to be used prescriptively in back country situations and prescribed fire for habitat improvement and fuels management has been used since the 1980s to curb forest succession.

The ecological and economic impacts caused by noxious weeds are numerous and include impacts to water quality, reduction in long-term production of land, loss of native vegetation species, increased erosion, and loss of wildlife habitat (MFWP 2010). An emerging issue related controlling noxious weeds in Montana in relation to bighorn sheep is the use of domestic animals to control infestations through grazing. The FNF has an active weed management program and much of FNF is grizzly bear habitat and any use of domestic goats or sheep for weed control would be carefully evaluated.

Conservation

The issues surrounding bighorn sheep are all focused on producing adequate numbers of deer and elk for hunting, wildlife viewing, and disease prevention. MFWP establishes population objectives, sets hunting regulations and conducts population monitoring on bighorn sheep herds. In all MFWP Regions and hunting districts statewide, MFWP biologists identify harvestable surpluses of big game, and fix hunting seasons and bag limits designed to remove that surplus. Conservation groups, agencies and MFWP work with landowners to remove or reduce the risk of disease associated primarily with domestic sheep by separating wild and domestic sheep by distance or by converting sheep grazing to cattle grazing or easements with no grazing.
Montana's 2010 Bighorn Sheep Conservation Strategy sets the overall direction of bighorn sheep management in Montana for the next 10 years. The statewide objectives are:

1) Monitor bighorn sheep populations in a consistent manner statewide to determine demographic trends, which will aide in making management decisions.
2) Manage populations at levels consistent with available habitat, other land uses, and at levels providing consumptive and non-consumptive use of the wildlife resource.
3) Identify metapopulation structure and function and develop strategies to protect and enhance the long-term connectivity in those populations.
4) Work with private landowners and land managing agencies to identify, maintain and enhance bighorn sheep habitat.
5) Manage existing populations at objectives. There are 45 actively managed populations of bighorn sheep in Montana of which 20 are at objective, 7 are over objective and 18 are below objective. Statewide objectives for the total number of bighorns in the 45 populations are 6,615 sheep and numbers are currently 921 below that objective. FWP needs to assess on a population basis what feasibly can be done to achieve those objectives.
6) Establish five new viable and huntable populations over the course of the next 10 years and augment existing populations where appropriate.
7) Monitor the health of all bighorn sheep populations under the management authority of FWP including source (sheep used as transplant animals) and nonsource populations.

8) Implement strategies designed to facilitate the effective separation between wild sheep and domestic sheep and goats.
9) Pursue the better understanding of bighorn population genetics to evaluate genetic diversities of herds and overall genetic fitness of populations and subpopulations forming metapopulations.
10) Develop a central database for storing and analyzing bighorn sheep data, including population survey, harvest, health, (including genetic status), and translocation data.
11) Continue involvement with the Western Association of Fish and Wildlife Agencies and associated Wild Sheep Working Group to ensure coordination of bighorn sheep management issues with western states and provinces and to provide information to FWP staff on the latest management issues with wild sheep.

FNF LRMP Amendment 21 establishes a Forest-wide goal to "provide appropriate habitat and access to maintain desired hunting, fishing, and viewing opportunities, in coordination with the Montana Department of Fish, Wildlife, and Parks." Forest plan direction for big game species, aquatic resources and grizzly bears, along with technical assistance from MFWP biologists, ensures habitat components essential for quality big game habitat and reasonable access are maintained. Amendment 19 improves habitat security through motorized access management. Invasive species will continue to be treated under a forest-wide weed management plan (USDA Forest Service 2001c). FNF LRMP standards, such as an emphasis on restoration of fire as an ecological process benefit this species. Forest Plan direction Wildlife and Fish Standard 10, Sensitive Species - The biological evaluation shall be conducted or reviewed by qualified persons as determined by the Forest Supervisor. Forest Service policy (FSM 2670.32) is to review programs and activities, through a biological evaluation as part of the NEPA process, to determine their potential effects on sensitive species. Adverse impacts to species whose viability has been identified as a concern would be avoided or minimized.

Recent wildfires, forest management, and prescribed fire that promote vegetative reproduction favorable for big game browse and forage and openness adjacent to bighorn escape cover and along movement corridors will ultimately prove beneficial to most populations. Since the late 1980s over 35,000 acres of habitat have been improved via prescribed burns, planting, slashing, weeding, and acquisitions. Minimizing human disturbance and mortality in sensitive habitats (i.e., lambing and winter ranges) as they become known will be important for individual herd management.

Evaluation of Current Situation on NFS Lands

Summary for the bighorn sheep and its habitat:

- Has limited presence on the FNF, but dispersed across the state and North America.
- Is a Sensitive Species and a review of programs and activities occurs through a biological evaluation to determine potential effects on sensitive species.
- The greatest population threat, contact with domestic sheep, does not occur on FNF as there are no sheep grazing allotment permits.
- Their populations are managed primarily through hunting seasons regulated by the state.

- Their habitat is conserved through forest management associated with access, remoteness of habitat, prescribed or wildfire projects, and coordination and technical assistance with MFWP biologists.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
54. Open Road Density

While other factors outside of the Forest Service's control (i.e. contact with domestic sheep, highway traffic) may have negative effects on the bighorn, based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes for the bighorn according to the suitability and capability of NFS lands and not lead to a trend toward federal listing. Do to the isolated nature of bighorn sheep on the FNF there appears to be little risk of herd loss from management actions in habitat or within linkage areas and transitory herd use will be maintained.

BLACK-BACKED WOODPECKER (*Picoides arcticus)*

The black-backed woodpecker is a Sensitive Species and Management Indicator Species on the Flathead National Forest (FNF). This woodpecker is an indicator that the needs of other species that use early post-fire lower montane and montane forests are met. There is a substantial amount of black-backed woodpecker habitat on the FNF due to an increasing number of large, high-intensity fires in the last decade. This species is encountered in high densities in these habitats on the FNF. There appears to be little risk of population loss and the FNF should maintain a viable population where the capability of the natural habitat permits.

<u>Natural History</u>

Black-backed woodpeckers are cavity nesters that occur at highest densities in one to six-year-old burns with an abundance of snags for nesting and beetles as well as wood-boring insects for feeding (Hutto 1995a, 1995b; Saab et al. 2004). Nappi and Drapeau (2009) found high nest densities and reproductive success in severely burned spruce forests, with declining nest success as time since burns increased. In Montana, black-backed woodpeckers occur at high densities in burned forests from one to six years following the burn (Hejl and McFadzen 2000; Hitchcox 1996; Caton 1996; Hutto 1995a). Russell et al. (2007) developed habitat suitability models for black-backed woodpeckers in post- wildfire landscapes. They found that the best predictors of black-backed woodpecker habitat included pre-fire canopy cover of 40-100%, pre-fire patch size with a mean of 278 acres $\pm$ 81 acres, and a post-fire vegetation burn severity of moderate to high.

Hutto (2008) reports that the black-backed woodpecker is "extremely specialized on severely burned forests". He found that "96% of their detections on Landbird plots were in burned forest conditions, where this species was "16 times more likely to occur than anywhere else."

Furthermore, their reproductive success is uniformly high in burned forests (Saab and Dudley 1998, Saab et al. 2007, Vierling et al. 2008)". Hutto (2007) also collected bird survey data from each of 17 separate fires in western Montana in each of the four years following the fires of 2003, including six fires on the FNF. He found that many bird species are relatively common in burned forests, with the black-backed woodpecker being more restricted to burned forest conditions than any of more than 100 other bird species for which they had sufficient data. Higher abundance of black-backed woodpeckers in burns led Hutto to suggest that populations are maintained by a patchwork of recently burned forests across the landscape. Burned forests are believed to act as source habitats from which birds emigrate once post-fire conditions become unsuitable.

Hutto's preliminary results also suggested burned forests that were harvested fairly intensively (seed tree cuts, shelterwood cuts) within a decade or two prior to the fires of 2003 were much less suitable as post-fire forests to the Black-backed woodpecker and other fire dependent bird species. Even forests that were harvested more selectively within a decade or two prior to fire were less likely to be occupied by Black-backed woodpeckers. From Hutto (2008):

> "…the legacy (Franklin et al. 2000) of forest structure (e.g., tree sizes and densities) prior to fire disturbance affects the suitability to fire specialists after disturbance. Black-backed Woodpeckers, for example, require burned forests that are densely stocked and have an abundance of large, thick-barked trees favored by wood-boring beetles (Hutto 1995, Saab and Dudley 1998, Saab et al. 2002, Russell et al. 2007, Vierling et al. 2008). Indeed, data collected from within a wide variety of burned forest types show that the probability of Black-backed Woodpecker occurrence decreases dramatically and incrementally as the intensity of traditional harvest methods increases"

Black-backed woodpeckers are highly mobile and appear to migrate at least 30 miles to exploit recent burns (Hoyt 2000). Dudley and Saab (2007) estimated an average home range size of 511 acres of high-quality habitat per nesting pair.

Black-backed woodpeckers also do occur in unburned landscapes (Bull et al. 1986). During extended periods of wet, cool summers when few fires burn, black-backed woodpeckers appear to disperse and forage on small bark beetle outbreaks at low densities (Saab and Dudley 1998). Hoyt and Hannon (2002) reported black-backed woodpeckers in old forest stands long distances from any burned areas, suggesting the species is not "restricted" to post-burn areas. Nappi and Drapeau (2009) suggested that old growth habitats may allow population persistence between fires in regions with longer fire cycles.

Population, Habitat, and Distribution

The black-backed woodpecker is an uncommon and wide ranging species that breeds from central Alaska and northern Canada south to the mountainous regions of California, Wyoming, the Black Hills, the upper Great Lakes, the New England states, and into Newfoundland. Due to a preference for wildfires the population is thought to be eruptive and nomadic making it difficult to monitor during years of low populations or limited fires. Evidence suggests the black-backed woodpecker is increasing in numbers in the United States (as cited in Dixon and Saab 2000). The range of the black-backed woodpecker in Montana is primarily confined to the western portion of the state

(MFWP 2005). Habitat for the black-backed woodpecker is abundant and well distributed across the Northern Region and by Forest (Samson 2005). In addition, habitat amounts are expected to increase as fires and insect outbreaks continue to increase in size and in a pattern distinctly different from the recent past with fire suppression (Zack 1994, Gallant 2003, Hessburg and Agee 2003 and others). No scientific evidence exists that the black-backed woodpecker population is decreasing in numbers (Samson 2005). Lester (1980) studied a pine beetle outbreak in the North Fork of the Flathead River and found mostly northern three-toed and hairy woodpeckers. Black-backed, downy and pileated were much less common. Additional research recently concluded (Cilimburg, et al. 2007) with their single year study of not finding any significant populations of black-backed woodpeckers utilizing beetle outbreak areas. Their results suggest that in Northern Region forests, decision makers and biologists should continue to manage postfire forests with the black-backed Woodpecker in mind.

An analysis of national Breeding Bird Surveys (BBS) for 1966–1996 indicated a significant increase (6.7% change/year) in black-backed woodpecker populations in spruce-hardwoods survey routes and a significant increase (6.6% change/year) in the United States survey routes. No route from 1966 to 2004 in the BBS database shows a long-term decline for black-backed woodpecker. In northwest Montana, it is likely that black-backed woodpecker populations increased between 2003 and 2008 due to the large number of acres that experienced high intensity burns during this period (Draft Habitat Guidelines for the Black-backed Woodpecker, Northern Region, USDA Forest Service, 2010). In Montana, the black-backed woodpecker has a state ranking of S3: "Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas."

At the Northern Region 1 USDA Forest Service scale, Hillis, Jacobs, and Wright (2003b) concluded that historically, burned forests 1 to 6 years old covered about 2% of the landmass of forests in Region 1. They also found that between 1940 and 1987, black-backed woodpecker habitat declined to only 18.8% of that historic level because of very successful fire suppression. Large fires in 1988, 2000, and 2001, however, brought the average for the 1940 to 2001 period up to 75.4% of the historic level. When Hillis, Jacobs, and Wright (2003b) looked just at the period from 1988 to 2001, the level of available black-backed woodpecker habitat was 284.4% of average historic levels. This trend continues with the fire years of 2003 and 2007.

Region 1 describes how estimates of black-backed woodpecker habitat in burn areas in 1990-1993 range from 0 ha (on five National Forests) to 16,010 ha (39,560 acres) on the Nez Perce N. F.; enough post-fire habitat for 128 to 222 pairs. Estimates of black-backed woodpecker habitat in burn areas in 2000-2003 ranges from 5,534 ha (13,675 acres) to 359,308 ha (887,850 acres), or enough habitat for from upwards of 44 to 77 pairs to 2,898 to 4,490 pairs (Samson 2005). Estimates of black-backed woodpecker habitat in insect-infested areas in 1990-1993 range from 956 ha (2,362 acres) to 179,352 ha (443,179 acres), providing habitat for 7-13 pairs to about 1,446 to 2,491 pairs. Estimates of black-backed woodpecker habitat in insect-infested areas in 2000-2003 range from 9,992 ha (24,690 acres) to 304,099 ha (751,429 acres); providing habitat for 80 to 139 pairs to about 2,452 to 4,224 pairs (Samson 2005). How many black-backed woodpeckers bred in either the post-fire or insect-infested areas during the intervals from 1990-1993 or 2000-2003 is unknown. However, recent research findings and Regional and National Forest monitoring indicate black-backed woodpecker populations are still reasonably high. Several researchers including Hitchcox (1996), Caton (1996), Hejl and McFadzen (2000), and Powell (2000) found numerous nesting pairs of black-backed woodpeckers on fires that burned in 1991, 1988, and 1998 respectively. Crews (O'Connor and Hillis 2000, Monson and Boniecki 2002) found numerous nesting pairs on fires that burned in 1998 and 2000 respectively. This research and monitoring indicates black-backed woodpeckers are present and nesting in high densities in burned forests.

As described in the Northern Region's assessment (Samson 2005), it is clearly evident that there has been a consistent and often substantial increase in the amounts of post-fire habitat on all 12 National Forests in the Northern Region. Additional habitat is predicted to occur as discussed in Westerling et al. (2006). They report - wildfires have consumed increasing areas of western U.S. forests in recent years. Competing explanations are discussed for this increase: climate vs. a history of land use management. Climate involves temperature, moisture and early spring snow melt while land uses include grazing; land use involves effective fire suppression and extensive forest regrowth following logging of the 19th century. "Regardless of past trends, virtually all climate model projections indicate that warmer springs and summers will occur over the region in coming decades. These trends will reinforce the tendency toward early spring snowmelt and longer fire seasons. This will accentuate conditions favorable to the occurrence of large wildfires, amplifying the vulnerability the region has experienced since the mid-1980s".

An analysis of vegetation composition, structure, and landscape pattern on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007 (monitoring item #68), found that 15% of the FNF has had some intensity of wildfire between 1998 and 2008 (Table 2c). An analysis of 10 large fires indicated that an average of 47% of the area within the fire perimeter burned with high intensity, creating high quality habitat for Black-backed woodpeckers. These large, stand replacing wildfires have been part of the natural processes that have shaped historic conditions on the FNF and are moving areas towards larger patch sizes which have been the norm historically. Only 1.7% of the burned area has had salvage logging following wildfires, so over 500,000 acres on the FNF provided high quality habitat for Black-backed woodpeckers during this time period. The 2008-2010 FNF monitoring report added that fire has caused sizeable changes on the landscape in the last decade, dwarfing the impacts due to forest management, particularly in the watershed of the North Fork of the Flathead River (USDA-FS 2010). The magnitude of change on the landscape over that decade due to harvest represented only 9% of the total change that occurred.

Table 2c. Acres Burned From 1998 to 2008 by Sub-basin.

Sub-basin	All Ownerships Burned	% of All Lands in Sub-basin	FS Acres Burned	% of FS Lands in Sub-basin
North Fork	166,002	27%	70,621	24%
Middle Fork	123,658	17%	49,658	13%
Flathead Lake	No data available for valley bottom			
South Fork	183,901	17%	183,874	18%
Salish	26,316	5%	25,806	12%
Swan Valley	13,342	3%	11,003	4%
Grand Total	513,232	**12%**	340,966	**15%**

An analysis for the 2007 Brush Creek Fire Salvage project estimated over 500,000 acres has burned in the Northern Rocky Mountain Forest-Steppe Coniferous Forest Ecological Province since 2003. In addition to these acres, the nearby Chippy Creek Fire burned close to 100,000 acres in 2007.

Potential habitat for the black-backed woodpeckers is plentiful throughout Region 1 as Samson (2006) showed that the Forests and the Region as a whole had not reached a critical 20-30% threshold of historic habitat remaining on the landscape, and forested ecosystems are more extensive now than in historic times. A USDA-FS (2008b) update to Samson (2005) shows approximate black-backed habitat based on Forest Inventory and Analysis (FIA) data of approximately 3.8 million acres in the Region with the FNF having an estimated 118,657 acres of habitat. A 2008 state insect and disease condition report shows dramatic increases in acreages of tree mortality from 2002 to 2005 (USDA-FS 2006d) with conditions continuing into 2007 (USDA-FS 2008). From 2007-2009 most forests in Montana have shown increases in insect-caused mortality (USDA-FS 2010b). The Beaverhead, Deerlodge, Gallatin, Helena, Lewis & Clark and Lolo NFs have experienced major increases in the amount of insect-infested habitat. Of course not all acres from fire or insects are suitable habitat for black-backs and a proportion has or will be salvaged; yet a large amount of acreage continues to be created for black-backs annually.

Threats

Fire suppression has had adverse effects on black-backed woodpeckers, by substantially reducing the amount of burned forests. Timber harvest, such as salvage logging (Hutto and Gallo 2006), especially during extended low fire periods, can further reduce the amount of fire-killed forest habitat available to black-backed woodpeckers. Areas excluded from fire or salvage of dead, bug-killed or blowdown trees may prevent or limit resident populations. Management is needed to ensure that fire, insect, or wind are allowed to regularly disturb habitat throughout space and time. Information is needed to demonstrate how different pre- and post-fire timber harvesting activities can be accomplished while minimizing the negative effects on the most fire-dependent species, and how the species disperses across a landscape. Also the potential for interaction between fire severity and time since fire makes the evaluation of fire effects on species complex as in Smucker et al. (2005) vegetation cover and relative abundance for many bird species differed due to fire severity, time since fire, or both.

Conservation

Black-backed woodpeckers appear to be more dependent on burns in northwest Montana and their long-term persistence may depend on the frequency of recently burned forests within their dispersal range. Hoffman (1997) suggests a viability strategy for the black-backed woodpecker should be regional in scale. Both disease and fire, ecological processes important to the black-backed woodpecker, often operate at a relatively large scale, in time and space, due to factors such as climate (Schoennagel et al. 2004). Big fires, of 1889 or 1910 magnitude, tended to occur on a scale that typically encompassed a 5th code hydrologic unit (about 100,000 acres) to a 4th code hydrologic unit (about 1,000,000 acres). Losensky (2002) concluded such big fires occurred at the rate of one or two per decade in Region 1. A strategy to decrease fire suppression to allow natural occurrences in isolated areas is important. As an example, the FNF has been successful using wildland fire use as a tool to help restore forest health and reduce the risk of catastrophic fire in the Bob Marshall and Great Bear Wilderness Areas for the past two decades. In 2007 FNF included the suitable areas on the east side of Hungry Horse Reservoir, mostly the higher elevations adjacent to the Great Bear Wilderness, on the west side of the Reservoir including portions of Columbia Mountain, and parts of the Spotted Bear RD, to selectively use naturally ignited fire. Parts of large fire areas will always remain unsalvaged and in blocks as large as practicable (MFWP 2005). The level of salvage timber harvest across the landscape of the Northern Region is insignificant (Samson 2005). Tremblay, et al (2010) also suggest the conservation strategy for the maintenance of black-backed woodpecker and other recent dead wood associated species is to leave recent dead wood in harvest units, and to preserve 100 ha patches of old growth coniferous forests that produce high quantities of dead or dying trees in the landscape.

While the black-backed woodpecker may have been affected by past fire-suppression activities and timber salvage, the amount of post fire salvage harvest is limited, and the current amount of habitat is surplus to what occurred historically. Salvage operations include recommendations that maintain pockets of uncut burned areas as recommended by Dudley (2005), Hejl and McFadzen (2000), Saab, et al. (2002), USDA-FS (2007b) (such as moderate and high crown closures and consist predominately of moderate to high burn severity (Hutto 2006, 2007, 2008), of at least 75 acres and averaging 100 acres, and utilization of other project considerations). Bond et al. (2012) recommended retention of large patches of burned forest in all fire areas large enough to support black-backed woodpecker home ranges (total fire area >100 ha (247 ac), based on Siegel et al. 2012b). Where some snag removal is planned, retained patches should; 1) incorporate areas with the highest densities of the largest snags and the highest availability of prey (wood-boring beetles)(see Siegel et al. 2012a) in the interior of the fire area (see Saab et al. 2011), and 2) avoid harvesting and firewood cutting in fire-killed forest stands during the nesting season (generally April-July). The rationale for these recommendations is to improve nesting success in the early post-fire years.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states “Project decisions will not result in loss of species viability or create significant trends towards federal listing.”

FNF LRMP standards, such as protection of existing old growth, retention of higher densities of snags, and an emphasis on restoration of fire (prescribed or fire use) as an ecological process, also benefit this species.

Evaluation of Current Situation on NFS Lands

Summary for the black-backed woodpecker and its habitat:

- Is abundant and found throughout FNF, western Montana and widely dispersed across North America.

- Is highly mobile and opportunistic; responding to insect outbreaks following forest fire, windfall, and disease.
- Evidence of increasing numbers in the United States (as cited in Dixon and Saab 2000). No demographic information exists to suggest a decline in black-backed woodpecker numbers.
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation with effects minimized through forest management standards associated with riparian habitat, old growth habitat, down woody material/snags.
- Substantial amount of habitat on FNF due to an increasing number of large, high-intensity fires in the last decade.
- While affected by past fire-suppression activities and timber salvage, habitat has recently increased across the FNF and Region 1, and amounts are expected to increase as fires and bark beetle outbreaks continue to increase in size.
- The amount of current post fire salvage harvest is limited, and the current amount of habitat is surplus to what occurred historically.
- FNF LRMP standard for maintenance and protection of existing old growth.
- The best available scientific data available indicates a comparison of habitat required for a minimum viable population to that available indicates well-distributed habitat far exceeds that needed, given the natural distribution of species and their habitats as mapped and according to the scientific literature (Samson 2006b).

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
68. Vegetation Composition, Structure, and Landscape Patterns
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Other factors outside of Forest Service control (such as global climate change) may have effects on this species. Based on the above analysis, management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the black-backed woodpecker and not lead to a trend towards federal listing while contributing to the overall Regional viability for this species. The species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

BOREAL (WESTERN) TOAD (*Anaxyrus (Bufo) boreas*)

The boreal (western) toad is a Sensitive Species and Management Indicator Species on the Flathead National Forest (FNF). Among other species and habitats, this toad is an indicator that the needs of other species that use lake edges and small wetland habitats are met. This toad is widespread across the FNF. This species had had extensive survey effort on the FNF, having been found to be widely distributed and often in high numbers (see below). There appears to be little risk of population loss across the FNF and species viability will be maintained.

Natural History

Boreal toads breed in a wide variety of aquatic habitats including low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, ditches and marshes, to high elevation ponds, fens, and tarns at or near treeline. They exhibit a preference for shallow, warm areas with mud or silt bottoms (Maxell 2000). Breeding sites used by toads can undergo a high level of fluctuation in water levels from year to year due to drought, natural variation in groundwater and runoff levels, and changes in water yield and water temperature caused by tree harvest and wildfires. After breeding, adult toads disperse into surrounding terrestrial habitats and can remain away from surface water for relatively long periods of time. Adult boreal toads are largely terrestrial and travel considerable distances from water (Muths 2003, Schmetterling and Young 2008). Although small wetlands and small waterbodies on the Flathead may go through large fluctuations in water levels from year to year, and may even dry up during some years as a result of drought, boreal toads are highly mobile and monitoring has shown that they appear to re-occupy sites during years when water levels become suitable.

Guscio (2007) reported consistent increases in the numbers of boreal toads and their breeding sites in areas burned by wildfires across multiple years in nearby Glacier National Park, while no increases were documented in unburned areas of the Park. This research found toads that bred in the Robert burn in the spring of 2003 were found exclusively in burned habitats during the summer months that followed and found that toads used high severity burn areas much more than would be expected. The authors suggested that toads exploited severely burned areas because these sites were more open and that toads could use burned areas without great risk of increased water loss, as long as they had cover. They also found that boreal toads shifted their use away from severely burned habitats to moderately burned areas later in the summer because partially burned areas had more ground/canopy cover and likely retained more soil moisture (Guscio et al. 2008).

Population, Habitat, and Distribution

The range of the boreal toad includes much of the western United States and Canada up to Alaska. This species is found throughout the mountains and intermountain valleys of the western third of Montana on both sides of the Continental Divide (Maxell et al. 2003) in 27 counties (MFWP 2005).

This toad is well distributed across western Montana, with over 2,800 observations recorded (Montana Natural Heritage Program 2016). In a systematic survey of standing waterbodies in 40 randomly chosen 6th hydrological unit code watersheds across western Montana, boreal toads were found in 27% (11/40) of watersheds surveyed across western Montana, and breeding was observed in 21% (7/33) of the watersheds that have apparently suitable breeding habitat (Maxell 2000). Additionally, boreal toads were found in 3.7% (13/347) of the standing water bodies that were surveyed. Similar surveys conducted at 400 sites in Glacier National Park found boreal toad reproduction at less than 5 percent of the sites surveyed in 1999 and 2000, and surveys on the

Flathead Indian Reservation found boreal toads at 4 of 9 sites where they were historically observed.

Eggs, tadpoles, juveniles, or adult boreal toads have been observed in 32 of the 65 sub-watersheds (6th-code Hydrological Unit Code) surveyed on FNF during years of annual citizen-science “Herp Days” Surveys (Tables 3b and 3c below). Many of the 104 sub-watersheds across the Flathead National Forest that have not been surveyed by the Forest Service are in wilderness areas and thus very difficult to survey (39 are entirely roadless), or are located essentially on lands not administered by the US Forest Service. In the last ten years, the Montana Natural Heritage Program database has 62 records of this species on FNF, including an estimated 58,000 juveniles and immature toads from about 27 sites (USDA-FS 2016b).

Of the 70 sites where boreal toads were observed on the Flathead National Forest as of 2012, there were 76% in the NL1E riparian landtype, 6% in the FL1C landtype, 4% on lake margins, 1% in NL1A, and 11% outside riparian landtypes. These landtypes are found on all FNF Ranger Districts but comprise a small fraction of the land base (Table 3a)(*Note that previous versions of this report included riparian landtypes on other lands within the FNF outer boundary*). NL1E, the dominant riparian landtype on the FNF, is characterized by a low gradient (nearly level, valley bottom, 2-4% slopes), with relatively fine substrates (clays, silts, fine and medium sand), with a willow and sedge potential vegetation community. NL1A is also characterized by a low gradient with relatively fine substrates but with a subalpine fir/spruce potential vegetation community, while the similar FL1C areas are flat with relatively fine substrates with a spruce potential vegetation community. Riparian wildlife habitats across FNF area appear to be functioning well, with numerous and well-distributed lakes, ponds, seeps, streams, and rivers providing a diversity of habitats (Table A of Sirucek and Bachurski 1995). The majority of incidental observations were of tadpoles in roadside ditches or of adults found upland and away from breeding habitat. Note that modelling efforts for FNF LRMP revision, which are in progress, may include smaller lakes but not NL1A, and that the Mission Mountain Wilderness was not included. According to the LRMP Draft EIS, the Forest has over 45,000 acres of modelled breeding habitat and the boreal (western) toad is known to use a wide variety of sites for breeding (USDA-FS 2016c, 2014).

Table 3a. Acreages (and Approximate Percentages of Riparian Landtypes across FNF lands) that are likely to Encompass Breeding Habitat for Boreal Toads on the FNF. Mapping includes Mission Mountains Wilderness but was not completed in the Great Bear and Bob Marshall Wilderness Areas.

FNF Ranger District	NL1E	FL1C	NL1A	Total
Glacier View (~308,000 ac)	1,125 ac (0.4%)	855 ac (0.3%)	158 ac (0.1%)	2,138 ac (0.7%)
Hungry Horse (~414,500 ac)	946 ac (0.2%) *	351 ac (0.1%) *	201 ac (0.1%) *	1,498 ac (0.4%) *
Spotted Bear (~1,032,000 ac)	664 ac (0.1%) *	349 ac (0.0%) *	168 ac (0.0%) *	1,181 ac (0.1%) *
Swan Lake (~411,000 ac)	5,443 ac (1.3%) *	1,868 ac (0.4%) *	3,251 ac (0.8%) *	10,562 ac (2.6%) *
Tally Lake (~226,500 ac)	3,122 ac (1.4%)	2,738 ac (1.2%)	1,689 ac (0.84%)	7,549 ac (3.3%)
FNF Total	**11,300 ac (0.47%)**	**6,161 ac (0.26%)**	**5,468 ac (0.23%)**	**22,929 ac (0.96%)**

* Riparian Landtypes on the Spotted Bear and Hungry Horse Ranger Districts were not completely mapped, as the Great Bear and Bob Marshall Wilderness Areas were not done.

FNF monitoring observations included more than 175,000 tadpoles and over 425 adult toads. The number of observations during these surveys fluctuates considerably from year to year depending upon a variety of factors including naturally fluctuating water levels at individual sites, weather variations and events, and a variable level of observer effort (represented by the number of sites surveyed per year in Table 3b).

Table 3b. Observations of Boreal Toads, 1994-2015, by Year during over 850 site visits of Citizen-science "Herp Days" Surveys. Most of the tadpole numbers recorded include an estimated range of which only the minimum is reported here.

Year	# Sites surveyed	# Adult Toads	# Toad Tadpoles
1994	1	0	0
1995	41	5	19,100
1996	22	16	197
1997	23	5	2,000
1998	34	7	400
1999	56	3	10,001
2000	42	5	2
2001	96	7	10,250
2002	132	351	14,300
2003	92	5	10,250
2004	58	25	20,000
2005	74	3	33,742
2006	74	58	32,016
2007	27	1	17
2008	64	8	908
2009	36	1	0
2010	49	0	343
2011	31	7	200
2012	18	1	420
2014	8	0	0
2015	17	0	0

Table 3c. Observations of Boreal Toads, 1994-2015, by 6th-code HUC Watershed, during over 850 site visits of Citizen-science "Herp Days" Surveys. Most of the tadpole numbers recorded include an estimated range of which only the minimum is reported here.

6th-code HUC Watershed	# Adult Toads	# Toad Tadpoles
170102060203	4	0
170102060307	1	0
170102060405	102	0
170102080101	1	0
170102080201	4	707
170102080208	5	0
170102080401	1	10,000
170102090703	1	598
170102090707	1	0
170102100106	5	10,000
170102100203	2	2,751
170102100301	0	34,500

6th-code HUC Watershed	# Adult Toads	# Toad Tadpoles
170102100302	2	18,355
170102100303	35	12,140
170102100304	6	22,202
170102100305	2	0
170102100306	0	205
170102100308	2	0
170102100401	2	100
170102100402	3	2
170102110104	4	10,261
170102110105	2	18
170102110106	1	200
170102110201	4	32,000
170102110202	55	2,001
170102110203	1	0
170102110207	76	550
170102110303	1	10,021
170102110306	1	8,003
170102110401	73	500
170102120101	21	2,000
170102120102	11	200
TOTAL	429	177,517

In an assessment of the Upper Columbia River Basin, the western (boreal) toad was expected to have a "favorable" outcome under current management direction (Quigley et al. 1996). When considering all ownerships, the outcome was somewhat less favorable (value of 3.4 on scale of 1 to 5, 1 being a continuous distribution) than when considering only lands administered by FNF Service and BLM (value of 2.6). In Montana, the boreal toad has an NHP state ranking of S2, "at risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state."

Boreal toads have been extensively monitored for close to 15 years on FNF and thy have been found to be well distributed across abundant aquatic, wetland, and riparian habitats and do not appear to be experiencing low numbers, isolated populations, or declines (USDA-FS 2016c). While riparian landtypes known to be boreal toad breeding habitat are very limited on the Flathead National Forest, consistent with an S2 state ranking, measures taken on Forest Service lands to protect riparian areas and consider boreal toads during land management planning continue to provide a favorable outcome. Overall, Maxell's (2000) conclusion for western Montana was that toads were recovering since a decline in the 1980s or were continuing to decline because populations were small, isolated, and/or subject to one or more factors impacting populations separately or synergistically, as had been known to occur in Colorado, Utah, Wyoming, and New Mexico (Maxell, 2000).

Threats

Numerous threats could lead to boreal toad population declines (Maxell 2000), including those typically suggested for all amphibians -- increased fungi and parasite infection, global warming, ozone depletion, introduced exotic predators and diseases, pesticides, and chemical pollution. Small breeding ponds created by seeps may dry out in some years before metamorphosis occurs, killing tadpoles and rendering reproduction entirely unsuccessful at that site for the year (Maxell 2000). Fish introductions into historically fishless lakes may adversely impact toads. Use of certain herbicides or pesticides within 100 meters of streams or other water bodies used by toads can also be lethal during certain stages of the toad life cycle (Maxell, 2000).

Specific to invasive species, die-offs of boreal toads in the Southern Rockies have been associated with chytrid fungus (*Batrachochytrium dendrobatidis*) infections (Daszak et al. 2000). Limb deformities in toads have been linked directly to trematode infections by *Ribeiroia ondatrae* (Johnson et al., 2002). Chytrid fungus is present in a variety of amphibians in Montana and deformities in toads have been observed in some areas (Maxell et al. 2004). Chytrid fungus is not yet known to be present on FNF, nor have any deformities been observed. Invasion of breeding sites by non-native bullfrogs, which feed on boreal toad eggs and tadpoles, has occurred in Ashley Lake. Invasion of small, shallow breeding ponds by Reed canarygrass (*Phalaris arundinacea*) has occurred in portions of the Swan Valley and in the Salish Range and can cause breeding ponds to clog up with vegetation and dry out.

Roads and heavy equipment can affect boreal toads. Boreal toads may congregate on and near roads in the late evening and early morning, making them vulnerable to being run over by vehicles (Maxell 2000). On upland sites, activities such as road construction, timber hauling, timber harvest, and fuel reduction activities can crush toads. Roadside ditch breeding sites are vulnerable to seasonal dry-up and impacts from activities such as road grading and maintenance, which typically occur during the late spring period when conditions are wet enough to sustain water in roadside ditches. Typically, though, the policy for open road management is to remove ponded water from the road ditch as soon as possible. Individuals could be affected if these actions occur while tadpoles are still dependent on water availability. At the FNF level, the magnitude of these effects is difficult to quantify, but appears to be relatively small as there are 3,566 miles of Forest Service System roads, of which 40% are open to public motorized use (USDA-FS 2016c) Traffic levels on most forest roads are low during the toad breeding season and most FNF roads do not have high-speed use like highways.

Land management activities such as timber harvest, fire, and road construction/maintenance, can affect boreal toads by changing vegetative cover, which can indirectly affect the water level and temperature in breeding sites. Since boreal toads prefer warm water, this is generally not a negative factor for the cold waters of FNF. In an Oregon study, Bull (2006) found that boreal toads used sites with tree harvest or prescribed burn activities in proportion to their availability and were not avoided by boreal toads. After the breeding season, toads selected habitat that included open forest canopies or openings in the landscape that were close to water, often on south facing slopes, and with a high density of burrows, rocks, logs, or rootwads that provided cover (Bull 2006). Areas with no trees, or with tree seedlings, were used more than expected based on availability, while older stands were used less. The findings of Guscio (2007) after fires in Glacier National Park, in addition to other findings, have led to the hypothesis that the boreal toad benefits from certain types of disturbances. If boreal toads are responding to disturbance, forest management practices (e.g., fire suppression) may play important roles in habitat suitability and demographics of some populations of this species. Cattle grazing in and near shallow ponds may be a stressor for boreal toads, but is a minor factor on FNF because it is predominantly a forested environment.

Conservation

Although timber management, road building, livestock grazing, and residential development have undoubtedly affected the amount and/or quality of functional breeding habitat for the western toads in some areas, toad reproduction remains widespread on the Flathead National Forest. Management actions taken on the FNF, including incorporation of direction for snags and downed wood, as well as riparian protective measures, will provide the habitat composition, structure and processes to support boreal toad populations according to the suitability and capability of NFS lands.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards for snags and down logs and states that the FS will conduct analyses to review programs and activities to determine their potential effect on sensitive species, documented in a biological evaluation. It also states “Project decisions will not result in loss of species viability or create significant trends towards federal listing.”

Under FNF forest plan direction (1986, as amended), riparian areas surrounding perennial streams are managed under direction for MA-12 and MA-17, and forest-wide Inland Native Fish Strategy (INFISH) direction. Within MA-12, the forest plan goal is to enhance vegetation and wildlife diversity and maintain or enhance water quality and fisheries, emphasizing soil and water protection and old growth habitat. Timber harvest is permissible within MA-17, with a goal of maintaining age class diversity of overstory vegetation and enhancing riparian values. INFISH contains provisions for management of Riparian Habitat Conservation Areas (RHCAs), including placing buffers around streams, ponds, or springs/seeps that may be suitable as breeding sites. Timber harvest is generally prohibited within RHCAs except where needed to attain Riparian Management Objectives. Riparian and stream protective measures including the Montana Streamside Management Zone Law, Montana Water Quality Act, Clean Water Act, and INFISH, apply equally at larger scales including the Western Montana Planning Zone, and that portion of Region 1 within the state of Montana.

On the Flathead National Forest, there are hundreds of miles of roads closed by berms or other structures, where roadside ditches and ponded water will continue to provide suitable breeding habitat for boreal toads and where there is no potential for vehicle crushing. Other protections for grizzly bear habitat in the Northern Continental Divide Ecosystem portions of FNF, i.e. not allowing any project activities during spring (until July 1) provide protection for potential breeding sites such as road ditches. Protective measures for grizzly bear habitat also apply at larger scales, including the Northern Continental Divide Ecosystem.

The FNF has conducted annual surveys during FNF “Herp Days”. Equipment is cleaned prior to surveys to prevent infection and spread of invasive species. FNF invasive plant herbicide spray program is administered by certified applicators and fairly limited in scope, with any spraying near or adjacent to riparian areas undergoing careful application.

<u>Evaluation of Current Situation on NFS Lands</u>

Summary for the boreal (western) toad and its habitat:

- Is found throughout FNF, western Montana, and western North America.
- Survey and monitoring efforts continue to find this species well distributed in Montana and across FNF.
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation.
- Riparian areas are protected by buffers and ground-truthing that appear to be adequate to maintain breeding habitat for toads.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed
45. Change in Water Quality
46. Water Yield Change from Timber Harvest
47. Sediment Yield
54. Open Road Density

Other factors outside of Forest Service control may be associated with toad population declines (such as pollution, bacterial or fungal infection, climate change, increases in UV radiation, and introduction of predators or competitors). Based on the above analysis, management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the boreal toad and not lead to a trend toward federal listing. The species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

CANADA LYNX *(Lynx canadensis)*

The Canada lynx is a federally listed Threatened Species on the Flathead National Forest (FNF). The lynx was listed in March 2000 due primarily to a lack of regulatory mechanisms. Since that time, the USFWS determined in its Biological Opinion (USDI-FWS 2007e) that the Northern Rockies Lynx Management Direction (NRLMD), which was incorporated into 18 national forest plans, would substantially reduce or eliminate adverse effects to lynx from Forest Service land management activities on at least 11 million acres.

Lynx habitat within the Northern Rockies Geographic Area has been divided into lynx analysis units to facilitate analysis, management and monitoring. 109 lynx analysis units (LAUs) are wholly or partially on the FNF, mapped in accordance with the Lynx Conservation Assessment and Strategy (LCAS)(Ruediger et al. 2000). Lynx analysis units do not depict actual lynx home ranges, but are approximately the size of a female's home range (25-50 mi^2), contain at least 10 mi^2 (6,400 acres) of primary vegetation capable of supporting lynx, and encompass year-round foraging and denning habitat components (ILBT, 2013). These lynx analysis units encompass a total of about 2,384,000 acres on the FNF. Under NRLMD standard LAU S1, changes to lynx analysis units may only be made if site-specific habitat information demonstrates it is needed and after review by the Regional Office. No changes have been made to lynx analysis units on the FNF subsequent to their delineation in 2000.

Initial mapping of lynx habitat and delineation of lynx analysis units was done for the Flathead National Forest in 2000. At the forest-wide scale, biophysical attributes that can be derived from remote sensing data are used to identify potential lynx habitat. For example, maps such as elevation (to predict areas that likely provide deep, fluffy snow conditions for extended periods of time) and potential vegetation groups (to identify boreal forest types used by lynx) are used to model lynx habitat. This information can also be used to classify non-forest areas (e.g., rock, water) and exclude them from lynx habitat. The resulting map provides an estimate of the overall area that is capable of providing habitat for lynx. At any given point in time, some of this habitat is in a suitable condition and some provides lynx habitat in an unsuitable condition. Satellite imagery and forest databases can accurately classify recently harvested and burned areas, which helps to identify areas that are currently in an unsuitable condition. However, satellite imagery cannot detect dense horizontal cover that provides snowshoe hare habitat in a multistory forest structure, or coarse woody debris for denning habitat, which are important features of lynx foraging habitat. Therefore no forestwide estimates are made for these components of lynx habitat. During site-specific planning, the forestwide map of lynx habitat is field-truthed and refined, and lynx habitat is further characterized to estimate the amount and distribution of foraging and denning habitat components.

Within the LAUs, an estimated 1,795,000 acres provide lynx habitat; the remainder are low elevations lacking in deep, fluffy snow or inclusions which are not capable of producing boreal forest habitat (e.g., dry forest types, non-forest).

Natural History

Population and Distribution

In the contiguous United States, Canada lynx are at the southern margins of a widely-distributed range across Canada and Alaska. Lynx occupy a wide geographic area from the northern taiga forests and woodlands of Alaska and Canada to the southern boreal forests of Cascades, Rocky Mountains, the Great Lakes, and the northeast of the United States. Schwartz, and others (2002), demonstrated that lynx regularly travel distances greater than 100 km (and up to 1100 km). The genetic data suggest that long distance movements are common and result in high levels of gene flow. The area in northwest Montana that Squires et al. (2013) delineated as the occupied range of lynx in the Northern Rockies is used for the cumulative effects analysis area. This area spans about 13,900 mi2 and generally encompasses all forested areas with recent evidence of lynx presence, including telemetry locations from 1998-2007. The area is predominantly National Forest System lands, and also includes Glacier National Park, state managed lands, tribal lands and private lands.

Lynx occur at naturally low densities due to limited habitat and availability of their primary prey, snowshoe hares (Ruggiero, et al. 1994). In the southern part of its range, the low densities of lynx populations are likely a result of naturally patchy habitat and lower densities of their snowshoe hare prey (Adams 1959, Griffin 2004, Koehler et al. 1979, Mills et al. 2005). The lynx's long legs and wide feet allow it to live in deep snows of the boreal forests and effectively hunt the snowshoe hare. Squires indicated that lynx in western Montana prey almost exclusively on snowshoe hares during the winter (Squires et al. 2007). Squires located 86 lynx kills that included 7 prey species: Blue Grouse, Spruce Grouse, northern flying squirrel, red squirrel, snowshoe hare, least weasel, and white-tailed deer. Snowshoe hares contributed 96% of prey biomass. Red squirrels were the second most common prey (11 kills), but they only provided 2% biomass to the winter diet. One lynx killed two white-tailed deer that were slowed by deep snow and lynx occasionally fed on carrion (Squires et al. 2007).

Numerous historic and current lynx records exist in western Montana (USDA-FS 2007a). However, the population is difficult to monitor without the aid of a large scale telemetry or non-invasive sampling program. The FWS (USDI-FWS 2000b) concluded when listing the species, that a resident population of lynx is distributed throughout its historic range in Montana. However, available data are not sufficient to determine either population trend (increasing or decreasing) or estimates of population size. Museum records, trapping data and other information verify the historical occurrence of lynx in western Montana (McKelvey et al., 1999). Squires et al. (2013) compiled lynx distribution data collected from 1998-2007, including 81,523 telemetry points obtained from 64 resident lynx. Their best estimate of the current distribution of lynx in western Montana is an area about 8.9 million acres in size, ranging from the Purcell Mountains east to Glacier National Park, then south through the Bob Marshall Wilderness Complex to Highway 200. The Flathead National Forest lies in the heart of this area, highlighting its importance to lynx conservation (USDA-FS-2016c).

Lynx are known to be distributed throughout the Flathead National Forest. During 2010–2015, 15 individual adult or sub-adult lynx were captured and fitted with radiotelemetry collars on the Flathead National Forest, confirming that the North Fork, Middle Fork, and South Fork of the Flathead River drainages were occupied by lynx (USDA-FS 2016c). In addition, the Flathead National Forest has conducted carnivore monitoring in cooperation with Northwest Connections from 2011–2016 using remote cameras, hair snares, and track surveys. This effort detected additional lynx tracks in the Salish Range and an additional female with two kittens on the east side of Hungry Horse Reservoir.

Habitat

Based on current knowledge of the life history, biology, and ecology of lynx, certain elements are thought to be important to the conservation of the species. These are described in the Northern Rockies Lynx Management Direction (USDA FS 2007). Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat (LCAS 2001).

Lynx have large feet that are adapted for habitats with deep, fluffy snow and this is a defining habitat variable for lynx. In Squires northwest Montana study area, lynx used mid- to high-elevation forests (range = 4134 – 7726 feet, mean = 5715 feet) during winter and slightly higher elevations during summer (Squires et al. 2010). On the FNF, "deep snow" was defined as areas with at least 24 to 30 inches of snow. Below this snow depth, there is greater habitat use by mountain lions and coyotes (USDA FS 1999a, p.89-95). At lower snow depths there is an increase in competition for prey and an increase in potential predation on lynx.

In northwest Montana, Squires found that lynx foraged in forests composed of mature, large diameter trees with higher horizontal cover, more abundant hares, and deeper snow in winter. During summer, lynx selected habitats with high horizontal cover (mean = 65 percent), abundant total shrubs, abundant 3 to 7 inch d.b.h. trees, and spruce-fir species composition. Shrubs were predominantly huckleberry and alder. Lynx avoided conifer forests containing a high proportion of Douglas-fir trees, ponderosa pine trees, and grass in the understory (dry sites). Lynx selected a mosaic of forest stages to meet their seasonal resource needs and did not make seasonal movements to new spatial use areas, with winter being the most constraining season for lynx in terms of resource use. During winter, lynx avoided clear-cuts and openings across all spatial scales whereas in summer there was no evidence of avoidance (Squires et al. 2010).

Lynx are believed to be a disturbance-dependent species (Ruggiero et al. 1994). Disturbances such as fires, insect, disease and logging that create early successional stages can provide forage and cover for snowshoe hares (Maletzke, et al. 2008). After a disturbance such as stand-replacing wildfire or regeneration harvest, forests generally develop through several structural stages described by Oliver and Larson (1990) as "stand initiation," "stem exclusion," "understory reinitiation," and "old growth." Immediately after a disturbance, the removal of live trees and shrubs means these areas are not yet able to support snowshoe hares and lynx. As vegetation regrows, the burned or harvested areas develop into summer hare habitat. During this "early stand initiation" stage, if there is sufficient horizontal cover and adjacent forest edge, lynx may forage for hares in the regenerating forests during the summer months. Then, after approximately 20 years (the typical average time for this area), the trees and some shrubs will have grown tall enough to have branches at the snow surface, and dense enough to provide winter food and cover for hares. During the next couple of decades, this later "stand initiation" phase will likely provide winter snowshoe hare habitat, depending upon the species composition and density of regenerating trees. As the trees continue to grow, the stand will move into the "stem exclusion" stage, in which the crowns close, shading out understory vegetation, and the tree branches grow out of reach of the hares. Given enough time (several to many decades) and absent another stand-replacing disturbance, within-stand competition and disturbances such as windthrow and forest pathogens usually will create canopy gaps that enable the stand to develop into the "understory reinitiation" stage and eventually the "old growth" stage. However, in the boreal forests of the northern Rocky

Mountains where stand-replacing wildfire is a dominant landscape process, not all forest stands will reach the understory reinitiation or old growth stage. Instead they may burn before developing old growth characteristics or may stagnate in the stem exclusion stage.

On the FNF, western larch, lodgepole pine, Douglas-fir, and white pine generally are the dominant tree species on boreal forest habitat types during the early and late stand initiation stage. Some areas that experience intense stand-replacing wildfire and/or repeated burns may regrow as monotypic forests of lodgepole pine. If these lodgepole pine stands are extremely dense, the trees will move quickly into stem exclusion, losing their lower live branches and eliminating seedlings and shrubs in the understory due to competition and lack of light. Some of the extremely dense lodgepole pine forests that regenerated after wildfires in 1910, 1919, and 1929 have stagnated in the stem exclusion stage and do not provide snowshoe hare or lynx habitat. In lodgepole pine stands with a more moderate tree density, shade-tolerant trees such as subalpine fir or Engelmann spruce are able to establish in the understory and eventually dominate the stand. These stands are able to develop into a multistory structure that provides snowshoe hare and lynx habitat. Examples of both scenarios exist on the FNF.

Historically, the acreage burned by wildfires has fluctuated substantially from decade to decade on the FNF. Many factors, including weather, climate, ignition sources, available fuels, and fire suppression efforts, interact to influence the amount of acreage burned by wildfire in a given year. During the largest fire years about a century ago, the actual area burned on the Flathead National Forest was about 140,000 acres in 1890, 432,500 acres in 1910, 150,000 acres in 1919, and 90,000 acres in 1929. From 1939 to 1987, very few acres were burned. Starting in 1988, there has been an increase in acres burned; the three largest recent fire years burned about 235,000 acres in 2003, 120,000 acres in 2008, and about 100,000 acres in 2014 (USDA-FS 2016c).

In northwest Montana, Squires found that lynx located many of their dens in multi-storied stands of spruce-fir forests with high horizontal cover and abundant coarse woody debris. 80% of dens were in mature forest stands and 13% in mid-seral, regenerating stands. Young stands that were either naturally sparse or mechanically thinned were seldom used for denning. Lynx denned along the edges of regenerating forests where trees had blown down into jack-strawed piles of woody debris (Squires et al. 2006, 2008, 2010). At a landscape level, dens were generally in concave or drainage-like topographies and often on northeast aspects. Squires found that denning habitat is generally abundant across the coniferous forest landscape; especially in riparian habitats and in areas where insect or disease kills patches of trees. Given the large home ranges and low den site fidelity of lynx, den sites are not likely to be limiting (Squires et al. 2008).

Because of the recent increase in the prevalence and extent of wildfires, about 381,336 acres (approximately 21%) of lynx habitat in LAUs on FNF lands were burned by wildfire within the last two decades. In the subalpine zone that supports lynx habitat, wildfires are typically stand-replacing events, so the areas burned in the past 20 years will be in the early stand initiation stage, not yet providing snowshoe hare habitat in all seasons. Much of the forest that burned in the 1988 fires have developed sufficient height and density of trees and shrubs to produce winter snowshoe hare and lynx habitat; however, some stands that regenerated with extremely dense lodgepole pine stands (with 20,000-50,000 stems per acre) have already moved into the stem exclusion stage.

Since about 1950, the early stand initiation stage has also been created in lynx habitat by vegetation management activities, including timber harvest. About 30,926 acres (approximately 2%) of lynx habitat in LAUs was treated by regeneration harvest on national forest system lands of the FNF from 1994-2013.

Under NRLMD standard VEG S2, no more than 15% of lynx habitat on NFS lands can be regenerated by timber management projects within a lynx analysis unit in a ten-year period (except in the wildland-urban interface). Since the Flathead Forest Plan was amended in 2007, none of the LAUs has had more than 15% regenerated by timber harvest. In fact, on the FNF, only 10 of the 109 LAUs having had more than 5% of the lynx habitat acres regenerated over a 20-year period (Table 4a). As of 2015, there were 25 LAUs on the FNF (highlighted in gray in Table 4a) that have more than 30% of lynx habitat in an early stand initiation condition as a result of recent stand-replacing wildfires and regeneration timber harvest. Wildfire was clearly the driver in creating substantial acreages in a currently unsuitable (early stand initiation) condition. Under standard VEG S1, if more than 30% of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional lynx habitat may be regenerated by vegetation management projects (except in the wildland-urban interface).

Table 4a. Existing conditions of lynx analysis units (LAU) on the Flathead National Forest with regard to: acres of lynx habitat on NFS land, percent affected by stand-replacing wildfire during the previous 20-year period, percent affected by regeneration harvest during the previous 20-year period, and percent of lynx habitat that occurs within the wildland urban interface (USDS-FS 2016c).

Lynx Analysis Unit	% NFS land in LAU	Acres lynx habitat on NFS land	% lynx habitat affected by wildfire 1996-2015[a]	% lynx habitat affected by regeneration harvest 1994-2013[b]	% lynx habitat in wildland-urban interface
Albino Necklace	99%	14,269	13%	None	None
Ashley Herrig	30%	6,660	None	1%	87%
Babcock Creek	100%	11,665	8%	None	None
Bear Creek	96%	21,039	28%	<0.5%	52%
Bent Whitcomb	100%	21,268	63%	1%	4%
Big Prairie Cayuse	100%	11,042	49%	None	None
Big Salmon Lake	97%	22,216	46%	None	None
Black Bear Helen	100%	14,766	79%	None	None
Blacktail	79%	13,680	<0.5%	2%	80%
Bond	82%	10,903	None	None	37%
Buck	68%	9,854	16%	None	61%
Bunker Creek	100%	23,273	45%	<0.5%	None
Canyon	96%	23,578	45%	3%	16%
Challenge Granite	100%	17,419	18%	None	None
Clayton Anna	100%	16,183	66%	4%	None
Coram Abbot	84%	6,653	none	None	37%
Cox Creek	100%	19,936	4%	None	None
Dirtyface Spruce	100%	13,023	5%	None	6%
Dolly Varden Creek	100%	24,864	14%	None	None
Doris Creek	100%	24,118	24%	3%	9%
Dryad Miner	99%	16,882	<0.5%	None	None
Elk	77%	18,879	7%	6%	29%
Emery Creek	100%	12,844	None	1%	2%
Essex Java	99%	14,052	15%	None	29%
Evers Reid	73%	9,586	<0.5%	10%	82%

Lynx Analysis Unit	% NFS land in LAU	Acres lynx habitat on NFS land	% lynx habitat affected by wildfire 1996-2015[a]	% lynx habitat affected by regeneration harvest 1994-2013[b]	% lynx habitat in wildland-urban interface
Felix Logan	100%	17,471	13%	None	None
Foolhen Danaher	100%	25,440	10%	None	None
Glacier	92%	21,066	40%	6%	20%
Graves Forest	100%	21,221	8%	None	<0.5%
Haskill Mount	76%	7,885	None	5%	37%
Hay	90%	22,318	None	None	11%
Holbrook Bartlett	100%	29,119	47%	None	None
Holland	81%	8,294	None	3%	53%
Hungry Horse Creek	100%	11,537	None	None	None
Hungry Picture	100%	18,561	30%	None	None
Kah Soldier	100%	15,288	9%	<0.5%	8%
Krause	85%	13,308	<0.5%	None	50%
Lakalaho	100%	21,148	<0.5%	None	18%
Lake Five	58%	2,745	None	None	99%
Lion	98%	10,950	<0.5%	5%	None
Little Salmon Creek	100%	27,766	11%	None	None
Lodgepole Creek	100%	21,319	4%	None	None
Long Cy	100%	21,494	23%	None	none
Lost	78%	12,365	12%	None	<0.5%
Lost Jack Mid	100%	13,182	91%	None	None
Lost Tally	89%	9,590	None	6%	99%
Lower Beaver	86%	16,661	<0.5%	11%	39%
Lower Big	99%	18,543	93%	<0.5%	9%
Lower Coal	53%	13,968	58%	None	17%
Lower Good	84%	19,746	<0.5%	6%	56%
Lower Gordon Creek	100%	15,795	42%	None	None
Lower Griffin	93%	17,622	57%	17%	25%
Lower Whale	94%	18,341	27%	3%	22%
Lower White River	100%	17,902	38%	None	None
Lower Youngs Creek	100%	18,885	50%	None	None
Martin Stillwater	90%	15,804	None	5%	16%
Meadow	87%	7,248	41%	5%	4%
Moccasin Nyack	92%	13,427	2%	<0.5%	64%
Moose	82%	11,102	None	1%	48%
Mud Lake	100%	10,488	62%	None	None
Murray Canyon	100%	12,625	None	<0.5%	None
North Crane	78%	10,258	None	2%	65%
North Trail	85%	26,722	1%	<0.5%	25%
Pale Clack	100%	13,956	3%	None	None
Paola Ridge	92%	9,534	<0.5%	1%	48%
Peters Crossover	100%	17,925	None	None	None
Piper	91%	18,696	<0.5%	10%	15%
Porcupine	63%	8,087	None	None	1%
Quintonkon Creek	100%	15,888	7%	<0.5%	2%
Rapid Basin	100%	29,821	25%	None	None
Red Meadow	87%	21,956	None	None	27%
Schmidt	83%	9,677	None	None	52%
Shadow Dean	100%	27,399	24%	None	None
Sheppard	94%	21,352	80%	17%	22%
Silvertip Creek	100%	12,540	35%	None	None
Slippery Bill	100%	12,587	14%	None	None
Soup	18%	2,351	None	None	None
South Cold	93%	17,989	<0.5%	2%	13%
South Crane	97%	13,938	None	3%	36%

Lynx Analysis Unit	% NFS land in LAU	Acres lynx habitat on NFS land	% lynx habitat affected by wildfire 1996-2015[a]	% lynx habitat affected by regeneration harvest 1994-2013[b]	% lynx habitat in wildland-urban interface
South Firefighter	100%	10,726	None	2%	None
South Trail Tepee	93%	20,236	76%	3%	40%
South Woodward	94%	13,370	1%	4%	8%
Spotted Bear Mountain	100%	20,943	53%	<0.5%	1%
Squeezer	51%	10,759	2%	1%	None
Stadium Gorge	100%	25,091	13%	None	None
Stanton Grant	95%	16,800	None	<0.5%	51%
Stony Jungle	100%	17,700	61%	1%	3%
Strawberry Creek	100%	16,688	27%	None	None
Sullivan Creek	100%	27,743	16%	1%	None
Teakettle	59%	6,868	1%	None	70%
Three Sisters Bungalow	100%	27,654	18%	None	None
Trail Bowl	100%	24,727	78%	None	None
Twin Creek	100%	18,890	5%	<0.5%	<0.5%
Upper Beaver	96%	10,684	<0.5%	<0.5%	<0.5%
Upper Big	98%	18,039	24%	None	None
Upper Coal	93%	23,894	7%	<0.5%	None
Upper Good	98%	28,384	15%	13%	23%
Upper Gordon Creek	99%	12,638	5%	None	None
Upper Griffin	81%	15,844	5%	2%	1%
Upper Logan	80%	17,893	<0.5%	12%	15%
Upper Trail	100%	15,404	None	None	None
Upper Whale	100%	21,775	<0.5%	None	None
Upper White River	100%	12,521	24%	None	None
Upper Youngs Creek	100%	26,021	59%	None	None
Vinegar Moose	100%	21,481	10%	None	4%
West Columbia	87%	7,851	None	None	86%
Wheeler Creek	100%	15,087	None	None	14%
Wildcat Mountain	100%	15,831	20%	2%	None
Woodward	21%	3,743	None	1%	1%

a - acres burned by wildfire may include areas with previous regeneration harvest so wildfire and regeneration percentages are not additive. These percentages are based forest scale data and are verified at project level.

b - based on USFS FACTS database, which does not include decisions not yet implemented. For inclusion of decisions not yet implemented see table 46.

A Regional, multi-scale lynx habitat assessment by Hillis et al. (2002) derived estimates of the proportions of foraging and unsuitable (early stand initiation) habitat components at the national forest-scale and compared them to forage and unsuitable (early stand initiation) habitat estimates at larger scales (Table 4b). This table summarized the situation for potential lynx habitat across the region and forest level, comparing it to the historic range of variability and the NLRMD's cumulative standard of 30% for NLRMD VEGS1.

Table 4b. Lynx habitat components at the Forest and Regional Scales.

Habitat Component	HRV*	NRLMD	Flathead National Forest	Region 1
Unsuitable	9.5%	30% max. VEGS1	10%	9.2%
Foraging	19%	--	9%	5.4%
Denning	10%	Distributed in LAU	--	15.1%

* HRV (Historic Range of Variability) reflects average conditions before fire suppression or logging substantially changed vegetative pattern.

Consistent with findings by Squires, denning habitat at the Region 1 level (15.1%) exceeds the historic range of variability (10%) and denning habitat is not limiting at broad scales (USDA-FS 2007a, page 173, USDI-FWS 2008a). Since lynx use a variety of sites for denning and these habitat elements are generally found in most areas, Squires (Squires, et al. 2008) believes that few lynx populations are limited by a lack of immediate den sites, especially given their large home ranges and low den site fidelity. Across the FNF, availability of foraging and denning habitats for lynx appears to be steadily increasing due to numerous large fires in the past.

At a landscape scale, a mosaic of forest structure, from young regeneration to mature multi-story stands across the landscape is recommended to provide for the habitat needs of lynx (ILBT, 2013). Kosterman (2014) studied the relationship between female lynx reproductive success and habitat composition and arrangement within home ranges on two national forests adjacent to the Flathead (Kootenai and Lolo NFs). Connectivity of mature forest, percent composition of young regenerating forest, low perimeter-area ratio of young regenerating forest patches, and adjacency of mature to young regenerating forest types were the most important predictors for overall lynx reproductive success in her study areas. Although Kosterman's 2014 thesis provides valuable new information with potential to inform changes in Forest Service management of lynx and lynx habitat, the relationships between vegetation composition and lynx reproductive success described in the thesis are not well enough understood to determine whether specific changes in management direction are warranted and what they should be. The parameters and metrics that Kosterman used do not directly correlate to Forest Service vegetation inventory data or the management direction established by the NRLMD. Kosterman and Rocky Mountain Research Station scientists are working to publish the results of her study in a peer-reviewed scientific journal.

Maintaining connectivity with lynx populations in Canada is an important consideration for long-term persistence of lynx in the northern Rockies (ILBT, 2013). Possible lynx linkage areas have been identified to assist in land use planning (Claar et al. 2003). These linkage areas are intended to allow for movement of animals between blocks of habitat that are otherwise separated by intervening non-habitat areas such as basins, valleys, and agricultural lands, or to maintain habitat connectivity where habitat naturally narrows due to topographic features. Several linkage areas that intersect the FNF were identified in the NRLMD FEIS, Figure 1-1 (USDA 2007a). Subsequently, Squires and others (2013) identified lynx travel corridors connecting Canada and northwest Montana using least-cost path modeling. A primary corridor was identified that extended from the Whitefish Range in the north, along the western front of the Swan Range and ended near Seeley Lake, Montana. A second modeled corridor extended along the east side of Glacier National Park southward through the Bob Marshall Wilderness Complex. The availability of forest cover is beneficial in facilitating lynx movement, while human developments, such as interstate highways or broad expanses of agricultural lands without cover, may deter lynx movements. State Highway 83 bisects the Swan Valley, but radio-collared lynx have been documented to cross this highway and it does not appear to impede their movements (Squires and Laurion 2000). Radio-collared lynx have also been documented crossing State Highway 2 between the FNF and Glacier National Park.

Threats

The Lynx Conservation Assessment and Strategy (ILBT 2013) identified anthropogenic influences that may affect lynx and lynx habitat, sorted into either the “upper tier” or the “lower tier.” The upper tier includes the anthropogenic influences that are of greatest concern to the conservation of the lynx: climate change, vegetation management, wildland fire management, and fragmentation of habitat. The “lower tier” of anthropogenic influences include recreation (primarily snowmobiling), minerals and energy management, forest/backcountry roads and trails, grazing by domestic livestock and mortality due to incidental trapping or illegal shooting. It is thought that the lower tier activities could affect individual lynx, but are not likely to have a substantial effect on lynx populations, and are of less concern for conservation of the species (USDA-FS 2016c).

Key stressors under USFS control:

Vegetation management: Vegetation management activities such as timber harvest, fuels reduction, planting, and precommercial thinning can affect lynx habitat by influencing stand composition and structure, the amount and distribution of dense horizontal cover providing snowshoe hare habitat, the amount and availability of large down wood, and the development of multi-story canopy layers (ILBT 2013). Timber harvest can also affect the diversity of successional stages and connectivity of lynx habitat within and between lynx analysis units. The effects on lynx may be positive, neutral or negative. In the past, timber harvest removed all size classes of trees, snags, and down logs in mixed species forests containing spruce-subalpine fir, resulting in loss of multistory stands as well as fragmentation of cover. On FNF during the last decade, timber harvest practices have been more favorable for lynx as a result of forest plan amendments, with fewer acres impacted by temporary loss of multistory stands that provide snowshoe hare and lynx habitat. Outside the wildland urban interface, precommercial thinning practices have also been more favorable for lynx, with fewer acres experiencing short-term reductions in snowshoe hare habitat.

Wildland fire: Stand-replacing wildfires (the most common type within lynx habitat on FNF) remove understory vegetation and tree canopy cover in the short-term, but can promote development of dense horizontal cover and recruitment of large down wood in the longer-term. Boreal forest types on FNF are prone to stand-replacing wildfires on average about every 100 years. On FNF, about 20 years must pass after the fire before vegetation re-establishes and grows sufficiently tall and dense enough to provide winter snowshoe hare habitat. During the early post-fire period, a large stand-replacing fire may negatively impact the ability of a lynx to secure food resources within its home range.

Fragmentation of habitat: Human-caused alterations of natural landscape patterns can reduce the total area of habitat, increase the isolation of habitat patches, and impair the ability of wildlife to effectively move between those patches of habitat (ILBT, 2013). Habitat fragmentation may be permanent, for example by converting forest habitat to residential or agricultural purposes, or temporary, for example by creating an opening but allowing trees and shrubs to regrow. Both lynx and their snowshoe hare prey are influenced by the spatial arrangement of their preferred habitats.

Recreation: Recreational activities potentially may impact lynx through loss of habitat, behavioral responses to human disturbance, or due to snow compaction that may result in changes in competition for snowshoe hare prey (ILBT, 2013).

Large developments such as ski areas can result in habitat loss and/or fragmentation. The Whitefish Mountain Resort (formerly known as Big Mountain) and the Blacktail Mountain Resort are in lynx habitat. Habitat loss occurs within ski resorts from the clearing of trees for ski runs and roads, lift infrastructure, restaurants, warming huts, ski patrol and maintenance buildings, and the like. Glading of slopes, removal of down woody debris, and snow compaction negatively affect winter snowshoe hare habitat.

Some anecdotal information suggests that lynx are quite tolerant of humans, although this has not been well studied. A variety of behavioral responses may be expected from individual lynx and in different contexts (ILBT, 2013).

In the past, some researchers have speculated that packed trails could serve as travel routes that might enable competing predators (e.g., coyotes) to access snowshoe hare prey in lynx habitat (Murray and Boutin 1991; Murray et al. 1994). However, in its remanded determination (Federal Register vol. 68, no. 128, pp. 40076-40101, July 3, 2003), USFWS found no evidence for competition between lynx and other predators such as coyotes, or if competition exists, that it exerts a population-level impact on lynx, and therefore did not consider this to be a threat to lynx. Additionally, Kolbe et al. (2007) completed a study of the effect of snowmobile trails on coyote movements in lynx habitat in northwestern Montana. They reported that coyotes in their study area were primarily scavengers in winter (snowshoe hare kills composed only 3% of coyote feed sites). Furthermore, coyotes did not forage closer to compacted snowmobile trails than random expectation, and the overall influence of snowmobile trails on coyote movements and foraging success appeared to be minimal. However, because snow compaction results varied across the 18 national forests encompassed by the NRLMD, Guideline HU G11 specified that designated over-the-snow routes or designated play areas should not be expanded outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. Each national forest was expected to map and update its baseline of areas that have consistent snow compaction.

In November 2006, the FNF issued a decision for a motorized winter recreation plan, also known as Amendment 24. Developed with consideration of the terms of a settlement agreement, the decision clarified where, when, and under what conditions over-snow vehicles are allowable on the FNF. The specific areas and routes that are suitable for motorized over-snow vehicle use are identified on maps, which were incorporated into the forest plan. Under this decision, about 68% of the Forest's lynx habitat has been closed to motorized over-snow vehicle use throughout the past decade. About 19% of the Forest is open to motorized over-snow use from Dec 1 to March 31 only, about 10% is open year-long (snow conditions permitting), and about 2% is open December 1 to April or May.

Mineral and energy development: Impacts to lynx from mineral activities could include the potential alteration or removal of lynx habitat, increased fragmentation, and the potential for human-caused mortality from high speed or high traffic levels on roads. In its biological opinion on the Northern Rockies Lynx Management Direction, USFWS (2007a) concluded that the application of the amendment guidelines would result in no or only minor adverse effects to lynx due to minerals and energy development. No adverse cumulative effects are anticipated.

Forest roads and trails: Construction of roads results in a small reduction of lynx habitat by removing forest cover. On the other hand, in some instances the vegetation along forest roads may provide good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging (Koehler & Brittell 1990). Mortalities of lynx due to vehicle collisions have been documented in Colorado (reintroduced animals on paved highways), in Minnesota (on paved highways), in Maine (on high-speed gravel roads), and in Montana (on highways). Collisions are unlikely to occur on forest roads that are traveled at slower speeds and have lighter traffic volumes than highways. Extensive (>600 km) backtracking studies in Montana found that lynx did not avoid gravel forest roads (Squires et al. 2010). Trails are typically narrow routes with a native surface; there is no information to suggest that trails have negative impacts on lynx (ILBT, 2013).

Livestock grazing: There is no existing research indicating that grazing or browsing by domestic livestock on federal lands would reduce the snowshoe hare prey base or have a substantial effect on lynx (ILBT, 2013). However it is possible that livestock browsing or grazing could reduce the forage and dense horizontal cover needed by snowshoe hares.

Key stressors not under USFS control:

Future climate changes: The preliminary Northern Region Adaptation Partnership risk assessment for the Canada lynx (NRAP 2015) states that lynx have little or no adaptive capacity to live in areas lacking snow and have limited ability to shift their diet away from snowshoe hares. Possible effects on lynx as a result of future changes in climate include: 1) potential upward shifts in elevation or latitudinal distribution of lynx and their prey; 2) changes in the periodicity or loss of snowshoe hare cycles in the north; 3) reductions in the amount of lynx habitat and associated lynx population size due to changes in precipitation, particularly snow suitability and persistence, and changes in the frequency and pattern of disturbance events (e.g., fire, insect outbreaks); 4) changes in demographic rates of lynx, such as survival and reproduction; and 5) changes in predator-prey relationships. The Lynx Conservation Assessment and Strategy did not provide management recommendations specific to climate change, although it did identify several information needs.

Vegetation change through time was modeled for vegetation types and for lynx habitat for the FNF LRMP revision using the SIMPPLLE model (USDA-FS 2016c). On the FNF over the next 50 years, the model predicts that subalpine fir presence will be maintained. However, a steep decline of nearly 20% in both spruce and lodgepole pine presence occurs in the cool-moist biophysical setting, likely due mainly to the effect of bark beetles. A large portion of FNF is currently in a moderate to high density class. Over the first three decades the model estimates that this proportion remains steady, but then declines while the proportion of low density forest increases Lower forest densities are probably largely driven by natural disturbances (fire, insect, disease) which converts large areas to early successional forest in the latter modelled decades, with temporarily less canopy cover.

These changes in vegetation were also modelled by Ecosystem Research Group (ERG) as they relate to potential snowshoe hare and Canada lynx habitat (USDA-FS 2016c). The natural range of variation (NRV) was modelled going back about 1000 years. ERG modeling estimated the maximum and minimum amounts of the stand initiation phase on the Forest that would have occurred historically due to naturally occurring fire, predicting that management under current the FNF LRMP would stay within the minimum and maximum range of NRV over the 5 decade time period. On the FNF, where conifer growth is rapid in the moist habitats providing lynx habitat and natural disturbance intervals are fairly infrequent, the acres of stand initiation phase will fluctuate up and down.

Over the past several decades, fire suppression has led to excessive fuels accumulation, particularly in lower montane forests that occur below higher-elevation lynx habitat. Under a warmer, drier climate scenario, these forests are also more susceptible to uncharacteristically severe wildfires, which may then spread into lynx habitat at higher elevations. If insects/disease kill scattered patches of trees in the overstory of multi-storied forests, it could increase the density of the understory, creating multi-storied stands after a lag time of a few decades, provided the loss of canopy cover is not too great. In contrast, stand replacing wildfires would create more stand initiation habitat after a lag time of a few decades. According to modelling of NRV, fire cycles affecting the amount of multi-storied and stand initiation habitat have probably occurred in the past and are likely to occur in the future in the mid to high elevation subalpine-fir and spruce forests of the FNF.

<u>Fragmentation of habitat due to highways or activities on private and state lands</u>: The Flathead National Forest does not have jurisdiction over state and federal highways, or lands on other ownerships (e.g., private, state, tribal). The Forest Service can support habitat connectivity through its management of NFS lands, by encouraging or acquiring conservation easements along highways, or cooperating in identifying appropriate locations for installation of highway crossing structures. Activities on other ownerships are discussed in the analysis of cumulative effects.

<u>Mortality due to incidental trapping or illegal shooting of Canada lynx</u>: Trapping and snaring of lynx is currently prohibited across the contiguous United States. Incidental trapping or snaring of lynx is possible in areas where regulated trapping for other species, such as wolverine, coyote, fox, fisher, marten, bobcat and wolf, overlaps with lynx habitats (Squires and Laurion 2000). A trapped lynx can be released, but there is potential for accidental injury or mortality. Kolbe et al. (2003) compared the use of a box trap, padded and unpadded foothold traps and foot snares to capture lynx, to assess trap efficacy and risk of injury. Trapper outreach and special FWP regulations are used as a tool to avoid or minimize incidental take of lynx. A recent court settlement with MFWP established a lynx protection zone, which includes the FNF, that restricts the size and the placement of traps and snares that can inadvertently catch lynx and requires bobcat trappers to check their traps at least once every 48 hours.

Conservation

Canada Lynx were listed as a threatened species under the Endangered Species Act in the contiguous United States in 2000 because of the inadequacy of guidance for conservation of Canada Lynx in the National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans (Reudiger et al. 2000). The overall goals of the Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) were to recommend lynx conservation measures, provide a basis for reviewing the adequacy of Forest Service land and resource management plans with regard to lynx conservation, and to facilitate Section 7 conferencing and consultation under ESA. The NLRMD (USDA 2007) was developed from conservation measures recommended in the LCAS. Management direction in the LCAS was replaced when the FNF Plan was amended with the 2007 NLRMD, but the LCAS is still used as a document providing some of the best available science. In accordance with the LCAS and NLRMD, the Lynx Analysis Unit (LAU) is used to assess the effects of Federal actions upon Canada lynx. The LCAS was last revised in 2013 (ILBT 2013).

The NLRMD direction applies to mapped lynx habitat on National Forest System land presently occupied by Canada lynx, as defined by the Amended Lynx Conservation Agreement between the Forest Service and the FWS (USDA FS and USDI FWS 2006)(NLRMD ROD p. 9). The lynx recovery outline (USFWS, 2005) stratified lynx habitat into 3 categories; core, secondary, and peripheral. Core areas are places where long-term persistence of lynx and recent evidence of reproduction have been documented, and the quality and quantity of habitat is available to support both lynx and snowshoe hare life needs. Six core areas were identified in the recovery outline, one of which is in northwestern Montana/northeastern Idaho. The Flathead National Forest is located entirely within the northwestern Montana/northeastern Idaho core area. The NRLMD (USDA-FS 2007a) commits the Forest Service to apply the standards and consider guidelines for specific actions regarding vegetation management, ski areas and other special uses management, mortality risk, and linkage areas.

On March 23, 2007, the USFWS issued a biological opinion on the effects of the NRLMD on the Distinct Population Segment of Canada lynx in the contiguous United States. The biological opinion was identified as the first-tier of a tiered consultation framework, with the review of subsequent projects that may affect lynx as being the second-tier of consultation. Second-tier biological opinions would be issued as appropriate, where proposed actions would result in adverse effects to lynx that were not fully analyzed in the first-tier biological opinion. In the NRLMD, a limited range of projects that would be conducted within the Wildland Urban Interface (WUI) and limited pre-commercial thinning for other resource benefits fell under exceptions or exemptions from amendment standards VEG S1, S2, S5, and S6. To minimize the impact of this incidental take, terms and conditions in the Incidental Take Statement limited the number of acres per Forest that could be treated in ways that adversely affect lynx habitat. These acres were allocated to each Forest subject to the NRLMD Record of Decision. The USFWS analyzed the effects of such projects on lynx in their first-tier biological opinion and provided an incidental take statement for these activities. Forest allocations of activity acres approved in the biological opinion for the 2007 decision are reported annually to the FWS. Acres treated on FNF since 2007 are shown in Table 4c. The USFWS provided reasonable and prudent measures and terms and conditions in order to minimize the incidental take.

Table 4c. Acres of lynx habitat on the Flathead National Forest treated with exceptions and exemptions to the forest plan vegetation standards (decisions from 2007 to October 2015).

Habitat	Estimated acres in the 2007 FEIS	Sum of acres with decisions for treatment
Lynx habitat outside the wildland-urban interface with decisions for precommercial thinning using the exceptions	1,460 (over 10 years)	929 (2007-2015)
Lynx habitat inside the wildland-urban interface with decisions for treatments using the fuels reduction exemption	103,800 (cumulative)	9,191 (2007-2015)

The FWS concluded that the management direction in the NRLMD would provide for the recovery of lynx (USDI-FWS 2008a). In their Biological Opinion on implementation of the NLRMD (USDI 2007), the USFWS determined that it would result in application of management direction on nearly 12.2 million acres of occupied lynx habitat, including all lynx habitat delineated in the recovery outline, and would substantially reduce or eliminate adverse effects to lynx from Forest Service land management activities on at least 94% of this area (likely nearer to 98%). The allowable level of incidental take has not been exceeded for the Northern Rockies analysis area or for the FNF.

On the FNF, extensive acreage of Wilderness, roadless, and grizzly core habitat provides security for species such as lynx by reducing the risk of mortality attributed to humans from vehicle collisions, incidental trapping and predator control, and reduces the potential negative effects associated with fragmenting small populations. These attributes are present on the FNF with approximately 69% in wilderness, proposed wilderness, or inventoried roadless lands. LRMP Amendment 19 improved habitat security through motorized access management. From 1995 through 2011, the FNF improved grizzly bear security habitat (area >0.3 miles from an open road and >2500 acres in size) by 171,255 acres (267mi^2) (USDA 2012). The percent of suitable lynx habitat where snowmobiling is allowed by Forest Plan direction decreased from 53 to 35% by implementing Amendment 24.

Lynx trapping is not allowed in Montana. With respect to unintended trapping of lynx, the known level of incidental trapping mortality has been low (J. Williams, MTFWP, pers. comm. 2013). It is unknown whether or not increased trapping of wolves associated with wolf trapping regulations recently approved by the states of Idaho and Montana would be likely to result in increased incidental trapping of lynx. On the FNF, potential negative effects from trapping predators to reduce livestock depredation are minor, because there are only 2500 permitted animal unit months on 111,000 acres across over 2 million acres of National Forest lands (with actual numbers even less due to 3 allotments in vacant status).

<u>Evaluation of Current Situation on NFS Lands</u>

Summary for the Canada lynx population and its habitat:

- Is a threatened species and thus Management actions with potential adverse effects will undergo consultation with the USDI-FWS.
- Is found throughout the FNF, western Montana, and widely dispersed across the northern portions of North America, but with low densities in the southern portion of the range.

- Has a large home range, is highly mobile, commonly disperses long distances (up to 100 – 1000 km), and has a very high level of gene flow.
- Harvest of lynx by trapping is currently closed in Montana.
- Conservation measures include on-going research on habitat use and response to wildfire as well as management activities, prey abundance, and competition.
- FNF actions and current conditions are consistent with the standards and guidelines in the Northern Rockies Lynx Management Direction in maintaining a mosaic of habitat conditions for yearlong use by lynx and also including in the mosaic abundant multistory, mature spruce–fir forests with high horizontal cover that are spatially well-distributed.
- The FNF is in compliance with the limits identified in the Incidental Take Statement for cumulative acres treated that would result in adverse effects. Cumulatively, forest carnivore management considerations include an ecosystem level approach including maintenance of diverse successional stages that include stand initiation and multi-storied hare habitat; retention of large physical structures commonly associated with late successional forest stands that are components for denning and foraging habitat; riparian habitat conservation from INFISH and RHCA management direction; and secure habitat governed by the Wilderness and Roadless Policies.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
17. Biological Evaluations (Assessments)
20a. Furbearer trapping records from MTFWP.
20b. Distribution of forest carnivores.
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

The Flathead Forest will continue to assess effects of its activities upon the Canada lynx and will continue to monitor the distribution of Canada lynx and other forest carnivores in cooperation with other agencies and private cooperators, as directed by A21.

The FNF continue to conduct cooperative carnivore surveys, as it has every winter since 2011-2012 as described above in the "Population and Distribution" section for this species. John Squires, the primary lynx researcher in the northern Rocky Mountains, has radio transmitters on several lynx in all major watersheds of the FNF.

Other factors outside of the Forest Service's control (non-target trapping mortality, high competing predator populations, global climate change, etc.) may affect lynx recovery. However, management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the Canada lynx. Forest actions and current conditions are consistent with the standards and guidelines in the Northern Rockies Lynx Management Direction and Terms and Conditions of the associated Biological Opinion. The FNF should maintain a viable population within the variability of the natural habitat and contribute towards the viability of the species as a whole.

CANADA LYNX CRITICAL HABITAT *(Lynx canadensis)*

Critical habitat was designated for Canada lynx in 2009 (Federal Register Vol. 74, No. 36, Wednesday, February 25, 2009) and revised in 2014 (Federal Register Vol. 79, No. 177, Friday, September 12, 2014). USFWS designated five units of critical habitat, in the States of Idaho, Maine, Minnesota, Montana, Washington, and Wyoming. Lynx critical habitat Unit 3 consists of 9,783 square miles in the Northern Rocky Mountains of northwest Montana and northeast Idaho. Lynx are known to be widely distributed throughout this unit, and breeding has been documented in multiple locations. Lynx critical habitat Unit 3 coincides with the lynx core area in northwestern Montana/northeastern Idaho. Lynx critical habitat Unit 3 overlaps to a large extent the NCDE recovery zone for the grizzly bear. According to the USFWS, this area appears to support the highest density lynx populations in the Northern Rockies. It likely acts as a source population and provides connectivity to other portions of the lynx's range in the Rocky Mountains. This area contains the physical and biological features essential to the conservation of the lynx laid out in the appropriate quantity and spatial arrangement.

Natural History

Population and Distribution

See the "Canada Lynx" section above. Across the FNF, designated critical habitat for lynx is very similar to areas mapped as lynx habitat, so the population and distribution information above also applies to lynx critical habitat.

Habitat

Under the Endangered Species Act, specific areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features which (1) are essential to the conservation of the species and (2) may require special management considerations or protection. The physical and biological features that are essential for the conservation of the species are called the Primary Constituent Elements (PCEs). The Primary Constituent Elements for lynx critical habitat, which are unchanged from the previous rule issued in 2009 (USDI-FWS 2009), are boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

a) Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface;
b) Winter snow conditions that are generally deep and fluffy for extended periods of time;

c) Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and
d) Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Not all areas of critical habitat contain snowshoe hares and their preferred habitat conditions. The Federal Register, Vol. 74, No. 36, February 25, 2009 [50 CFR Part 17] pg 8640 -*Criteria Used To Identify Critical Habitat*; states that "a primary consideration was evidence that an area supports breeding populations of lynx and a secondary consideration is that, in addition to supporting breeding populations, these areas provide connectivity among patches of suitable habitat (e.g., patches containing abundant snowshoe hares), whose locations in the landscape shift through time". The USFWS recognized that a particular patch of forest may not contain snowshoe hares and their preferred habitat at a given point in time; **"**The boreal forest landscape is naturally dynamic and usually contains a mosaic of forest stand successional stages. Stands may continue to provide suitable snowshoe hare habitat for many years until woody stems in the understory become too sparse, as a result of undisturbed forest succession or management (e.g., clearcutting or thinning)" (Federal Register, Vol. 74, No. 36, February 25, 2009 [50 CFR Part 17] Pg 8637).

Threats

In the Federal Rule listing Canada lynx critical habitat Unit 3, the USFWS identified timber harvest and management as a dominant land use requiring special management, depending on the silvicultural practices conducted and on the spatial and temporal distribution. Since lynx in western Montana prey almost exclusively on snowshoe hares during the winter, reductions in dense cover for hares reduces the quality and quantity of lynx habitat. Activities that, when carried out, funded, or authorized by a Federal agency, may affect critical habitat, and therefore, should result in consultation, include, but are not limited to:

1. Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx.
2. Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx.
3. Actions that would increase traffic volume and speed on roads that divide lynx critical habitat. (Federal Register, Vol. 74, No. 36, February 25, 2009 [50 CFR Part 17] Pg. 8644).

In matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they adversely affect adjacent foraging or denning habitat.

Development of private lands to support increased human populations will likely continue and may reduce or sever habitat connectivity across valleys that are located between blocks of lynx habitat on public lands.

Large developments such as ski areas can result in habitat loss and/or fragmentation. The Whitefish Mountain Resort (formerly known as Big Mountain) is within designated critical habitat while the Blacktail Mountain Resort is not. Habitat loss occurs within ski resorts from the clearing of trees for ski runs and roads, lift infrastructure, restaurants, warming huts, ski patrol and maintenance buildings, and the like. Glading of slopes, removal of down woody debris, and snow compaction negatively affect winter snowshoe hare habitat.

Downscaled winter climate and precipitation models have a higher level of uncertainty than summer climate models (NRAP 2015). There is a potential for future changes in climate to reduce the extent of deep snow habitats preferred by lynx. McKelvey et al. (2011) estimated that contiguous areas of spring snow cover would become smaller and more isolated throughout the Columbia River Basin, with greatest losses at the southern periphery, but with possible increases in snow at higher elevations in the core. In addition, spring snowmelt is already occurring about two weeks earlier in recent decades. Mills and Johnson (2013) forecasted that annual average duration of snowpack will decrease by 29–35 days by midcentury. This may result in a contraction of the area where lynx have a competitive advantage in deep snow.

Conservation

Critical habitat occurs on about 3,425 square miles of FNF lands, which is about 35% of critical habitat Unit 3. About 37% of the critical habitat on the FNF is in wilderness and special areas. There are only two Lynx Analysis Units on the FNF that do not include some critical habitat -- the Haskill Mount and Blacktail LAUs west of Flathead Lake and Highway 93. Conservatively, areas where regeneration timber harvest occurred since 1990 may not yet have developed dense understories of young trees, shrubs or overhanging boughs that protrude above the snow (PCE 1a)(USDA-FS 2016c). About 2% of lynx critical habitat on FNF has had regeneration timber harvest since 1990. In addition, areas that have been burned by wildfire since 1990 may not yet have developed dense understories of young trees, shrubs or overhanging boughs that protrude above the snow. About 24% of critical lynx habitat on the Forest has been burned by wildfires since 1990.

The designation of critical habitat does not prohibit development or forest management activities, but federal agency actions must not result in destruction or adverse modification of critical habitat. Each Federal action, including development, permitting, funding, and forest management, would be evaluated by the involved Federal agency, in consultation with the Service, in relation to its impact on the critical habitat (Federal Register, Vol. 74, No. 36, February 25, 2009 [50 CFR Part 17] Pg. 8621-8622). In addition, Federal Agencies are required to ensure that actions funded, authorized, or carried out are not likely to destroy or adversely modify Critical Habitat (Federal Register/Vol. 74, No. 36/Wednesday, February 25, 2009/Rules and Regulations) (USDI-FWS 2009).

On FNF, project-level analysis for lynx critical habitat is always completely separate from that applied to the Northern Rockies Lynx Management Direction, although the scientific basis of the analysis is essentially the same. Consultation on lynx critical habitat is not tiered to the NRLMD (USDA Forest Service 2007a). Project analyses consider the PCEs of lynx critical habitat and encompassed the appropriate landscape scale, consistent with the lynx critical habitat rule. Nevertheless, the NRLMD does include components that contribute to maintaining the PCEs of lynx critical habitat and avoid actions that potentially could adversely modify critical habitat.

Evaluation of Current Situation on NFS Lands

Summary for the Canada lynx critical habitat:

- Canada lynx is a threatened species with designated critical habitat, and thus management actions with potential adverse effects will undergo consultation with the USDI-FWS.
- All of the PCEs would continue to be available within Canada lynx critical habitat, well distributed across the FNF.
- Cumulatively, forest carnivore management considerations include an ecosystem level approach including maintenance of diverse successional stages that include stand initiation and multi-storied hare habitat (PCE 1a); retention of large physical structures commonly associated with late successional forest stands that are components for denning (PCE 1c), and foraging habitat; riparian habitat conservation from INFISH and RHCA management direction; and secure habitat governed by the Wilderness and Roadless Policies.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

17. Biological Evaluations (Assessments)
20b. Distribution of forest carnivores.
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

The Flathead Forest will continue to assess effects of its activities upon Canada lynx critical habitat and will continue to monitor the distribution of Canada lynx and other forest carnivores, in cooperation with other agencies and private cooperators, as directed by A21.

Other factors outside of the Forest Service’s control may affect lynx recovery. However, management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the Canada lynx. The species will remain present with the critical habitat primary constituent element (PCE) well distributed across the FNF. The FNF should maintain a viable population within the variability of the natural habitat and contribute towards the viability of the species as a whole within critical habitat Unit 3.

COMMON LOON (*Gavia immer*)

The common loon is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, the loon is an indicator that the needs of other species that use lakes are met. On the FNF, 25 lakes are known to be occupied by nesting loons or to have suitable nesting conditions. Statewide monitoring indicates a relatively stable loon population with some degree of fluctuation across their habitat in Montana. As long as cooperative annual monitoring and conservation efforts continue, there appears to be little risk of population loss and species viability will be maintained.

Natural History

Loons are totally dependent on water and are exceedingly awkward on land. They typically nest in shallow bays with vegetative cover on lakes larger than 20 acres. Fish make up about 90% of a loon's diet, and clear water is required for their underwater foraging technique. The quality and quantity of water flowing into loon lakes affects their ability to support prey species as well as influences the water clarity. Water level fluctuations during nesting season can flood a nest or leave it high and dry, both of which are likely to cause abandonment. During the nesting season, loons are extremely sensitive to human disturbance.

Population, Habitat, and Distribution

The common loon is the most abundant and widespread of the five loon species of loons found in North America (Piper, et al. 2010). The global population of the common loon is considered secure; however, many local populations are small and isolated, and are vulnerable to extirpation primarily due to habitat loss and human encroachment (MFWP 2005). The southern edge of the loon's breeding range extends into the United States across many of the eastern states and into the Rocky Mountains. The original extent of the population is unknown, although populations have declined with the settlement of the west. Northwestern Montana supports the highest density of nesting common loons in the lower 48 states west of the Mississippi River (MFWP 2005). Current statewide cooperative annual surveys (1994-2010, Figure 2) indicate approximately 117-194 adults in Montana, averaging 40-70 territorial pairs annually (Hammond 2008) and producing 33-54 chicks annually (2006 Montana Common Loon Working Group Report). The loon chick fledging rate in northwest Montana suggests a slightly increasing population. Statewide, evaluation of the last 14 years of Loon Day results indicates a relatively stable loon population with some degree of fluctuation across their habitat. However, Pough (2006) suggests common loons in northwest Montana may be near the region's carrying capacity given current habitat condition and the presence of apparently surplus floating individuals in the population. Although it is "common, widespread, and abundant" globally, Montana NHP state rank for common loon is S3B, which is "Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas." On the FNF, 25 lakes are known to be occupied or to have suitable nesting conditions.

Threats

Threats to the common loon include human-caused disturbance from recreational and fishing activities on breeding lakes. When flushed off the nest by humans or by excessive waves, eggs become vulnerable to predation or risk being dislodged from the nest. Additional, malicious killing, marine oil spills, fluctuating reservoir levels, contaminants (especially mercury, lead, and organic pollutants), acid rain, and diseases (i.e. botulism or aspergillosus) are risks to loons (Evers 2004).

In the western United States, small population size and marked sensitivity to human disturbance are important factors.

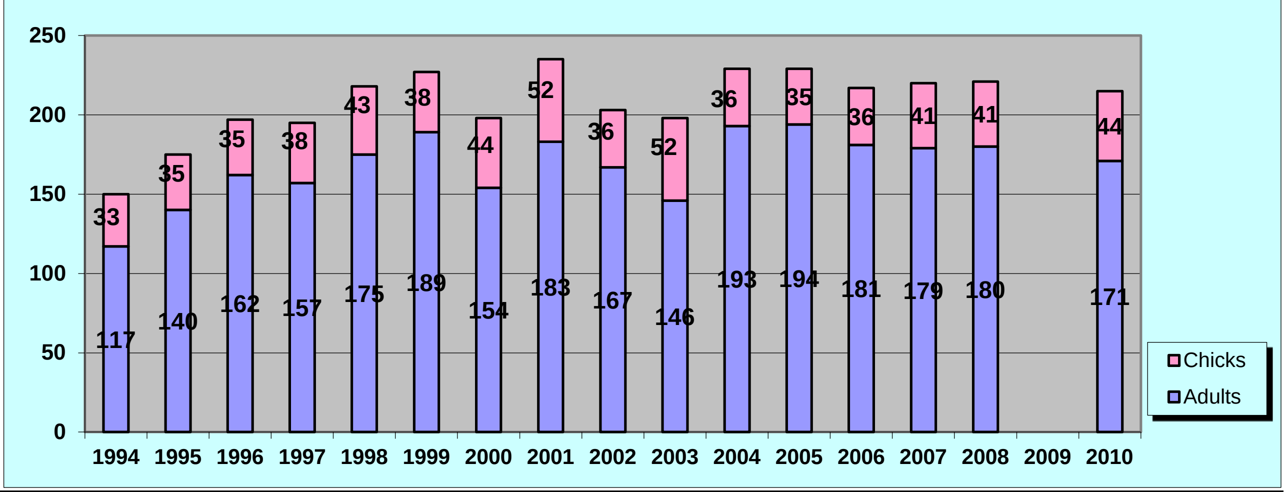


Figure 2. Numbers of Adult and Chick Common Loons on Loon Day, 1994-present, Northwest Montana

Conservation

Under the Forest Plan, riparian areas surrounding lakes and ponds are allocated to Management Area 12. The goal for MA-12 is to enhance vegetation and wildlife diversity and to maintain or enhance water quality and fisheries. This direction is compatible with protection of common loon habitat. Appropriate protection measures to limit human disturbances are being implemented. Public education focusing on bald eagles and loons has been used since at least 1988. Forest personnel place signs each year near several known loon nesting sites with the intention of minimizing disturbance during nesting. The FNF cooperates with other agencies and groups for surveys and nest site protections.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states “Project decisions will not result in loss of species viability or create significant trends towards federal listing.”

The Federal government required states to compile wildlife information and produce an overall strategy that identifies the state’s fish, wildlife, and habitat resources and conservation priorities. Montana’s strategy qualifies the state for federal research and conservation projects funds (DFWP 2005). The loon was identified as a Tier 1 species, one in greatest conservation need. Conservation concerns include disturbance to loons at nesting and foraging lakes, loss of nesting habitat, loss of connectivity, and accumulation of contaminants like lead. Federal funds have already been used by DFWP to help with University research projects. The Conservation Plan for the Common Loon in

Montana is based on these recent research findings and provides an array of tools for conservation of loons and their breeding habitat (Hammond et al., 2009).

Active conservation across the FNF includes implementing nest protection measures to limit human disturbances such as: 1. deploying floating signs to reduce boat activity near nest sites or chick rearing habitat, 2. using informational signs at bulletin boards and kiosks for anglers and boaters in occupied or foraging habitat and, 3. conducting public education efforts using Loon Rangers targeted at anglers and other watercraft users to reduce boat activity near nest sites and encourage responsible watercraft use near loon broods.

Evaluation of Current Situation on NFS Lands

Summary for the common loon and its habitat:

- Is globally secure, with low but stable population density in the southern extension of its range that extends into the northern Rockies to include Montana and the FNF.
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation.
- Loon conservation across and near the FNF includes multi-cooperative monitoring and conservation efforts for occupancy, active protection of breeding sites, and environmental education.
- The 2009 Conservation Plan for the Common Loon in Montana provides management and conservation recommendations for population, habitat, disturbance, coordination, monitoring, information and education, and research.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

19. Forest bird distribution, productivity, and survivorship monitoring stations.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
26. Fish Habitat; Need for Fish Habitat Improvement
29. Fish Habitat; Water Temperature
45. Change in Water Quality
46. Water Yield Change from Timber Harvest
47. Sediment Yield

Other factors outside the Forest Service's control (wintering grounds mortality, disturbance by boaters, heavy metal contamination, etc.) may negatively affect loons. Based on the above analysis, management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the common loon. Cooperative annual monitoring and conservation efforts continue are expected to continue. The species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

FISHER *(Martes pennanti)*

The fisher is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, the fisher is an indicator that the needs of other forest carnivores are met, as well as other wildlife that use closed-canopy montane forests, particularly mesic forests associated with riparian zones. The fisher has been petitioned for listing as a Threatened or Endangered Species. The USDI-FWS (2011b) and the fisher was not warranted at this time due to the evaluations of the five factors in listing a species. The fisher is present on the FNF and across western Montana in low numbers. As potential habitat appears to be plentiful on the FNF and across the Region 1, and the amount of late seral forest fisher habitat is expected to remain within the 75% range of historic range of variability there is no evidence that their population on the FNF is in decline.

<u>Natural History</u>

Fishers are generalized predators with many small to medium-sized prey species that use mesic, low-to-mid elevation (<6300' elevation) landscapes. They occupy a variety of dense mature and old upland and lowland forests, including coniferous, mixed, and deciduous forests, and early successional forest with dense overhead cover (Ruggiero et al. 1994). They are associated with riparian areas which are in many cases protected from logging and are generally more productive, thus having the dense canopy closure, large trees, and important structural elements associated with fisher habitat, such as broken tops, snags, and coarse woody debris. In the Cabinet Mountains (Vinkey 2003), fishers selected mixed conifer and cedar–hemlock stands and avoided using newly regenerating clearcuts and alpine areas. Most fisher locations were in dense forest stands with >76% canopy cover; stands with <50% canopy cover were avoided. At a stand scale, Schwartz and others (2013) suggested that mature forest stands most used by fisher are have both large and smaller trees, consistent with evidence that fishers need cover for hunting efficiency or predator escape purposes. Schwartz and others (2013) found that locations used by fisher at the stand scale were closely correlated with the maximum dbh of trees. There is no known threshold for minimum number and size of trees needed by fisher, but they are known to use the largest trees available. Fisher selected for stands containing western red cedar and grand fir, while they avoided ponderosa pine and lodgepole pine stands (Schwartz et al. 2013). On FNF, western red cedar and most grand-fir habitat types are included in the warm-moist biophysical setting and are at suitable elevations for use by fisher.

Jones (1991) found that over 80% of his fisher relocations were within 100 meters of a riparian zone or wet area. The importance of riparian areas for the presence of fishers has been shown in studies conducted in British Columbia, the southern Sierra Nevada in California, and northwestern Montana (Zielinski et al., 2004). On FNF, most of the habitat modelled by Olson and others (2014) occurs as riparian stringers rather than large patches. Jones (1991) and Roy (1991) concluded that mature stands are used most heavily in the winter, whereas, a mix of mature and old stands are preferred in the summer. Wetlands and recently logged areas typically have little overhead cover, which likely exposes fishers to greater risk from aerial predators and escape cover, such as trees for climbing, is farther apart in these environments, making fishers further susceptible to terrestrial predators. Thus, Weir and Corbould (2010) found that a 25% increase in open areas (wetlands and recently logged within past 12 years) within a potential home range reduced the relative probability of fisher occupancy to almost nil.

In the Northern Rockies, fishers evolved with disturbances such as insects and diseases, blowdown events and wildfires that created openings in mature forested habitats. These younger forests can promote a diversity of prey species and have long-term benefits for fisher populations (Jones 1991). A pulse of large logs on the ground can provide denning structures and cover, but are likely to be avoided if the canopy cover is less than 40%. Fishers can travel relatively long distances, and daily movement of 5 to 6 km has been documented repeatedly. Home range size may vary based upon many factors, but the average for a female fisher is expected to be about 15 square miles (Jones 1991). Sauder and Rachlow (2014) described fisher habitat selection at the landscape scale, which they defined as an area from 12,355-24,710 acres in size. These authors characterized fisher habitat as a variety of habitat patches to support prey species within a matrix of mature forest arranged in connected, complex shapes and with few isolated patches (Sauder and Rachlow 2014). These authors found that the percentage of mature forest was not the best supported variable for predicting fisher occupancy, nor was the percentage of high canopy cover. Schwartz and others (2013) reported on habitat characteristics at multiple, nested scales. They described the landscape scale as features within a 0.62 mile radius surrounding known fisher locations. At a landscape scale, they found that fisher use was highest where large trees (greater than about 15 inches dbh) made up about 50% of the landscape, but began to decline when the proportion was higher. These results are similar to Jones and Garton (1994) who found fishers selecting mature and old growth forests during the summer, but using a wider array of habitats in winter.

The most important fisher foods reported in the literature include snowshoe hares, porcupines, deer, passerine birds, and a variety of vegetation. Red-backed voles, red squirrels, and short-tailed shrews also have been reported in fisher diets (Witmer et al. 1998). Snowshoe hares are the most common prey for fishers. For fishers in the Cabinet Mountains of Montana, 50% of the prey remains found in 80 scats were from snowshoe hares. Mice and other small rodents constituted the next most common prey (Roy 1991 *IN* Ruggiero et al. 1994).

As summarized by the USFWS, “Though capable of long-distance movements, fisher generally have small dispersal distances. Small dispersal distances may be a factor of fishers’ reluctance to move through areas with no cover (Buskirk and Powell 1994). Thus, where habitat is fragmented it is more difficult to locate and occupy distant yet suitable habitat, and fishers may be aggregated into smaller interrelated groups on the landscape (Carroll et al. 2001, p. 974)” (USDI-FWS 2011b).

Fishers are apparently tolerant of human activity, but the ease of human access into an area correlates with fisher mortality through direct or incidental trapping (Claar et al. 1999). Fishers generally avoid areas with significant human disturbance and conversely prefer large areas of contiguous interior forest with vegetative and structural aspects that lead to abundant prey.

<u>Population, Habitat, and Distribution</u>

Fishers range from eastern Canada west across boreal forests to southeastern Alaska and south to the western mountains of Utah, Wyoming, Idaho, and California. This includes northwest and west central Montana and northern and north-central Idaho. Recent range expansion has occurred in the eastern United States.

The historical distribution of fisher and fisher habitat in Montana is uncertain. Due to a lack of trapping records in Montana from 1929-1959, many biologists believed the fisher had been extirpated (Vinkey 2003). Trapping, as well as large regional fire events in 1910 and 1934, likely contributed to regional fisher population declines in the early 1900s (Jones 1991).

In five separate reintroduction efforts, fishers were translocated from Minnesota and British Columbia to the northern Rocky Mountains between 1959 and 1991 (Weckwerth and Wright 1968, Vinkey et. al 2006). Translocations placed 78 British Columbia fishers into western Montana and Idaho between 1959 and 1963 and another 110 fishers from Minnesota and Wisconsin into the Cabinet Range in northwestern Montana between 1989 and 1991. Vinkey and others (2006) stated, "We believe it likely that fishers from northwestern Montana are descended from both the 1959 and 1989–1991 reintroductions". One of the relocations was near Holland Lake on the Flathead National Forest, where 15 fisher were released in 1959 and 1960. Eleven of these fisher were subsequently "re-captured"; eight were killed by trapping, one was shot, one was found dead, and one was released alive. Four fisher that were released on the Kootenai National Forest (adjacent to the Forest), dispersed to the Forest and were later re-trapped and released (Weckwerth and Wright 1968). Subsequent to reintroductions, 18 fisher were trapped on or within 1 mile of the Forest boundary from 1985-2002, according to MNHP records. Most of the trapped animals were listed as animals transplanted in 1959 or 1960, or were animals believed to be their offspring (MNHP 2013). The MNHP data base includes additional observations of fisher through 2008, but these observations have not been verified with trapped animals or DNA. According to a 1991 study by Roy, in the Cabinet Mountains of the Kootenai National Forest, at least 9 of 32 fishers transplanted from Wisconsin were known to have been killed by other predators (Ruggiero et al. 1994). It is possible that the differences between Wisconsin and Montana in habitat, topography, prey, and predators somehow made these fishers vulnerable to predation (Ruggiero et al. 1994). Information is lacking on the survival rates and reproductive success of fisher in the Northern Rockies (Sauder & Rachlow, 2014).

Non-invasive survey efforts have occurred from 2006-2015 over portions of FNF and adjacent Glacier National Park. The Southwest Crown of the Continent carnivore project conducted snow track surveys and used DNA collection methods (hair snares and bait stations) developed by researchers with the USFS Rocky Mountain Research Station. A 5 by 5 mile grid was overlaid on the entire SW Crown landscape (including the southern portion of the Forest) and these grid cells were systematically surveyed. From 2012-2014, 82 of the 129 grid cells were surveyed and no fisher were detected (Southwestern Crown Carnivore Monitoring Team 2014). However, grid cells in the remote Bob Marshall, Great Bear, and Scapegoat wilderness areas have not been surveyed, so it is unknown whether fisher may occur there. Surveys in Glacier National Park and on the rest of the Forest have also been unsuccessful in detecting fisher (USDS-FS-2016c). Even when fisher are known to be present in an area, they occur at extremely low densities and are very difficult to detect.

Vinkey (2003) reviewed historical records as well as carnivore research in Montana and concluded that the fisher is one of the lowest-density carnivores in the state. In high-quality habitats in British Columbia, fisher densities were between 0.03 and 0.04 per square mile or approximately 1 per 21,000 acres (USDA-FWS 2010). Interactions with other species in diverse ecosystems (e.g., mountain lions, wolves, coyotes, wolverines, and lynx) may affect fisher distribution, competition for prey, or these species may prey upon fisher. Fishers also appear to be restricted to areas with relatively low snow accumulation (Jones 1991). According to Ruggiero et al. (1994), deep, fluffy snow (which occurs on much of the Forest) affects habitat use by fishers and may affect distribution, population expansion, and colonization of unoccupied habitat (Heinemeyer 1993; Krohn et al. 1994)(Ruggiero et al., 1994). Powell and Zielinski stated that if trapping seasons are regulated carefully in Montana to prevent over-trapping, fisher populations may slowly expand, but if fisher populations are limited by deep snow, fishers may never reach high densities (Ruggiero et al., 1994).

Currently, eight national forests have some of their lands within the expected range of fisher in the USFS Northern Region (Cushman et al. 2008; Olson et al., 2014; Sauder & Rachlow, 2014; Schwartz et al. 2013, Schwartz 2007, Sauder 2014). Olson and others (2014) stated that fishers were more likely to occur in areas with wetter, milder climates characterized by higher mean annual precipitation, mid-range winter temperatures, and topography in the form of drainages or valleys. Raine (1983) found that movements of fisher were restricted by the soft, thick snow cover that was present during midwinter, whereas marten did not appear to be hindered by soft snow cover to the degree that fisher were. On the Forest, snow conditions may be a factor in limiting fisher populations and their distribution.

Fishers are more difficult to monitor than most species and monitoring results are often inconclusive. Lofroth, et al. (2010) noted that physical similarities between fishers and other related species necessitate rigorous identification standards in survey and monitoring programs. The likelihood of obtaining fisher hair is low due to its low population density. Fisher presence is difficult to determine using non-invasive sampling techniques such as hair collection, because not every sample will yield quality DNA for analysis (pers. comm, K. Pilgrim). Montana Department of Fish, Wildlife and Parks conducts winter track surveys for forest carnivores throughout the FNF, which resulted in 0 to 2.5 fisher detections annually from 1990 to 2000, with no apparent trend in the data (Flathead Forest Plan Monitoring and Evaluation Report, 2010). Winter track surveys are often inconclusive as well. The size of smaller fishers' tracks overlaps with the size of larger martens' tracks, so positive identification is difficult. Raine (1983) stated although fisher and marten used similar habitats, frequenting mature coniferous forests, they exhibited temporal differences in their habitat use that could be partially explained by their different responses to soft snow cover. These differences in habitat usage may be one of the factors that allows the two species to coexist as fisher appear to be limited in habitat and movement in times of soft snow cover. This may be another reason in the difficulty of surveying for this species. Vinkey (2003) studied fishers in the Cabinet Mountains of northwest Montana for 3 seasons and used traps, tracks, and track plates to detect species. During this time he encountered 126 martens, 30 fishers, 6 wolverines and 1 lynx. That study provided a glimpse into the rarity of fishers, wolverines, and lynx that are present in the ecosystem and the difficulty of surveying for these species.

Hillis and Lockman (2003) modeled fisher habitat in Region 1, where fishers are generally limited to west of the Continental Divide. Fisher habitat was defined as low-to-mid elevation, mesic, mature, and old forests within 100 meters of streams. To address patch size and habitat connectivity relevant for fishers, they excluded any patch of habitat that was less than 160 acres and more than 600 feet from the nearest patch of adjacent cover (Jones 1991, Ruggiero et al. 1999). That habitat was compared against levels of habitat that would have been available in pre-fire suppression/pre-logging periods (Table 5a).

Table 5a. Historic Range of Variability for Old Forest Fisher Habitat at the Flathead National Forest Scale (Hillis and Lockman 2003).

	Historic Range of Variability
Mature and old forest habitat	40% to 87%
Evidence of significant departure	None evident

Table 5b and 5c provide habitat acreage estimates at the forest and regional scales (USDA-FS 2008b), based on forested FIA plots.

Table 5b. Fisher Summer Habitat Estimates derived from FIA data, using models documented in USFS 2005, updated 2006 and in this paper (USDA-FS 2008b).

Unit	Summer Habitat		
	Average	90% Confidence Interval	Acres
Flathead	8.6%	6.9 to 10.3%	143,000 to 214,000
Region	12.4%	11.6 to13.1%	2,612,000 to 2,925,000

Table 5c. Fisher Winter Habitat Estimates derived from FIA data, using models documented in USFS 2005, updated 2006 and in this paper (USDA-FS 2008b).

Unit	Winter Habitat		
	Average	90% Confidence Interval	Acres
Flathead	34.9%	31.6 to 38.2%	657,000 to 794,000
Region	33.8%	32.6 to 34.8%	7,279,000 to 7,792,000

This suggests that fisher habitat occurs at historically normal levels at both the FNF and Region 1 scales. When fisher habitat was mapped, it clearly showed portions of Region 1 where timber harvest activities on both corporate and National Forest lands had fragmented and reduced the acres of existing fisher habitat. Hillis and Lockman (2003) point out that even during the 1970s and 1980s, when timber harvest was intensive, riparian zones were generally avoided, which could explain why habitat loss and fragmentation were not greater. Additionally, they speculate that the recruitment of mature/old forests due to fire exclusion, within what are typically very productive sites, could have substantially compensated for timber harvest-related losses.

At the Forest Service Region 1 scale, Samson (2006) concluded that fishers were secure in terms of their persistence throughout their range. Potential habitat for the fisher was found to be plentiful throughout Region 1, as Samson (2006) showed that the Forests and the Region as a whole had not declined to a critical 20-30% threshold of historic habitat remaining on the landscape, and forested ecosystems are more extensive now than in historic times.

The FNF LRMP Amendment 21 analysis (1998) looked at available data sources to assess historical old-growth conditions and historical variability. Historical old-growth conditions were estimated to vary widely over time at irregular intervals, in response to weather patterns, vegetation, and fuel conditions. Variability by forest type and position on the landscape (high versus low elevation) were also noted. It was estimated in Amendment 21 that old growth across FNF was from 15-60% historically, with a wide range of conditions occurring. Since the adoption of Forest Plan Amendment 21 in 1999, there has been no harvest of old growth, so changes that have occurred in that timeframe are due to natural processes -- in this instance, wildfire. Only one vegetation management project, to restore ponderosa pine old growth, is planned and currently under contract. An analysis of old growth forest on the FNF found that the 2003 estimated percentage of old growth on all forested lands on the FNF is 11.6% with a 90% confidence interval of 9.6-13.8%, based on the regional FIA summary database (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007, monitoring items #15 and #69). This estimate was re-affirmed in the 2008-2010 FNF monitoring report.

An analysis of vegetation composition, structure, and landscape pattern on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007, monitoring item #68) reported on changes in vegetation since the time of the Amendment 21 analysis in 1999. During this period, approximately 0.9% of the FNF was changed from a mid or late seral condition to an early seral condition due to regeneration harvest and 0.8% of FNF had undergone fuels treatment. The 2008-2010 FNF monitoring report added that fire has caused sizeable changes on the landscape in the last decade, dwarfing the impacts due to forest management, particularly in the watershed of the North Fork of the Flathead River (USDA-FS 2010).

In order to assess key aspects of fisher habitat, effects of alternatives on NRV, current conditions, and effects of alternatives for the revised FNF LRMP were modeled by Ecosystem Research Group (USDA-FS 2016c). The natural range of variation (NRV) was modelled going back about 1000 years and effects of alternatives were projected for the next 50 years, including anticipated changes in climate. ERG modelled fisher habitat based on Olson's characteristics (Olson et al. 2014). Fisher denning and resting habitat was modeled as forests with an average DBH class greater than 10", since trees in this class on the mesic habitats of the Forest generally have an average height greater than 65 feet tall (consistent with the Olson models). Cover types in the moist habitat type groups with presence of western larch, Douglas-fir, western hemlock, western red-cedar, and cottonwood, which may provide cavities used for resting and denning, were included. High elevation habitat types were excluded because annual precipitation falling as deep, fluffy snow is believed to be too high for use by fisher. Forest with a canopy cover class less than 15% was excluded from fisher habitat based upon the definition of an opening by Sauder and Rachlow (2014). Fine-scale habitat selection includes determining the presence of very large snags and large down wood.

The model indicated that historically, there was a wide range of natural variation of modelled fisher habitat of about 350,000 acres (resulting largely from wildfire). In the future, the model predicts fisher habitat would stay within the minimum and maximum range of NRV over the 5 decade time period. Modelled habitat occurs on up to about 600,000 acres and is distributed across much of the FNF, but the model is not able to consider the distribution of very large snags or down wood providing high-quality resting and denning habitat within a home-range sized area. Nevertheless, the overall trend can be projected. ERG's results show that acres of modelled fisher habitat initially increases by the end of the first decade and then declines back to current levels by decade 5 with current LRMP direction, which does not have management direction specific to fisher, but does provide direction for management of old growth, snags, and down wood. Much of the modelled decline is likely attributable to wildfire and/or the high amount of insects/disease portrayed in the model, both of which would cause widespread mortality of trees in the very large size classes.

Threats

The fisher population was reduced dramatically in the 1800s and early 1900s through overtrapping; predator and pest control; and alterations of forested habitats by logging, fire, and farming. At one time fishers were heavily trapped and, in addition, extensive logging has destroying its habitat. The extent of past timber harvest is one of the primary causes of fisher decline across the United States (Ruggiero et al. 1994). Logging may be one of the main reasons fishers have not recovered in Washington, Oregon, and portions of California as compared to the northeastern United States. Timber harvest can fragment fisher habitat, reduce it in size, or change the forest structure to be unsuitable for fishers (Green et al. 2008, Wisdom and Bate 2008). Habitat loss and fragmentation appear to be significant threats to the fisher (Ruggiero et al. 1994 and Lofroth et al. 2010). The USDI-FWS (2010) determined the present and potential future modification and destruction of habitat from commercial timber harvest and commercial wood production by methods that may prevent succession to the mature forest stages preferred by fishers. This is also due to the transition of some commercial timber lands to residential and commercial development in areas of western Montana.

The Northern Rocky Mountain region has a history of periodic regional wildfires and habitat in the Northern Rockies is likely sub-optimal (Lofroth et al. 2010, Schwartz et al. 2013). A period of fewer fires occurred from the 1940s to1980s, at the same time that fisher were being re-introduced in parts of Idaho and Montana and more fisher were detected during this time period. Since the late 1980s, the Northern Rockies has experienced more frequent fires (Westerling et al. 2006). Stand-replacing wildfires have increased substantially on the Forest since 1988.

Jones (1991), Vinkey (2003), Lofroth, et al. (2011) and others have concluded that fishers are extremely vulnerable to trapping, both intentional and incidental trapping with overtrapping in the early history of the United States contributing to the reduction in size and extirpation across the species' range. Following re-introduction, many fisher were trapped on the Forest during the 1980s and then trapping limits were reduced. In Montana, the species is legally trapped under a limited quota system, allowing for take of two individuals in trapping district 1, located in northwestern Montana (http://fwp.mt.gov/hunting/planahunt/huntingGuides/furbearer/). No fisher were trapped in Flathead County from 1996-2010 (Flathead Forest Plan Monitoring and Evaluation Report, 2010 and 2011). Regulated trapping in Montana is managed by Montana Fish, Wildlife & Parks through scientifically based regulations that sustain furbearer populations. FWP and the FWP Commission continually review and refine those regulations to ensure the use of best management practices for trapping activities.

Some climate models project that the lower elevations of northwest Montana will have less snowfall in the future, with more precipitation falling as rain. This could be beneficial to fisher, but downscaled model projections for winter precipitation are still highly uncertain. Over the long-term, according to the preliminary Northern Region Adaptation Partnership risk assessment for fisher (NRAP 2015), "Fishers are found in the relatively warm and wet conditions associated with the inland maritime ecosystem. Fisher habitat quality is projected to decline in virtually all areas where fishers currently exist, coupled with increased habitat quality in areas to the east and south. However, the old forest structures that fishers are currently associated with require significant time to form; it is unknown whether similar climate will equate to similar habitats in the short term". Under Olson's various models of future fisher habitat with respect to climate change, there is a gain of suitable habitat in the mountainous areas of Glacier National Park and areas south of Kalispell. However, there are uncertainties associated with these models because fisher must also be able to disperse if their habitat shifts. If fishers are unable to achieve regular dispersal distances greater than about a mile through unsuitable farmland or developed valley habitat, Olson and others predicted that the total area of available habitat would actually decline over time (Olson et al. 2014). Riparian areas on all lands may help to provide dispersal routes. The preliminary Northern Region Adaptation Partnership climate change risk assessment for fisher (NRAP 2015) estimated that the magnitude of effects would be low in 2030 and moderate in 2050 (consistent with ERG modelling results), with a high likelihood of effects across all time periods.

Conservation

In March 2009, the USFWS was petitioned to list the fisher and designate Critical Habitat. The Service determined that the Northern Rocky Mountain population of fisher may constitute a distinct population segment because of geographic separateness and possible genetic distinctness from other fisher populations. The Service also stated that this population may be significant because the loss of fisher in the Northern Rocky Mountains may result in a significant gap in the range of the fisher in the United States. On April 16, 2010 the FWS found that the petition presents substantial scientific or commercial information indicating that listing a distinct population segment of fisher in the Northern Rocky Mountains of the United States may be warranted. Therefore, with the publication of that notice, the FWS initiated a review of the status of the species to determine if listing the fisher in the Northern Rocky Mountains of the United States is warranted (USDI-FWS 2010).

After review of all available scientific and commercial information, the USDI-FWS (2011b) found that listing the fisher in the U.S. Northern Rocky Mountains (USNRMs), which includes portions of Montana, Idaho, and Wyoming, as threatened or endangered is not warranted at this time. The fisher was not listed as endangered or threatened based on any of five factors to list (USDI-FWS 2011b).

(A) The present or threatened destruction, modification, or curtailment of its habitat or range: The fisher is a forest-dependent species that evolved in the USNRMs in a complex landscape mosaic shaped by fire, tree disease, and windthrow. In the USNRMs, younger forests provide foraging habitat, but abundant mature and old trees that provide extensive canopy cover for resting and possibly denning are also considered important elements to support fishers on the landscape. The FWS concluded that the best scientific and commercial information available indicates that the fisher in the USNRMs is not now, or in the foreseeable future, threatened by the present or threatened destruction, modification, or curtailment of its habitat or range to the extent that listing under the Act as an endangered or threatened species is warranted at this time.

(B) Overutilization for commercial, recreational, scientific, or educational purposes: Targeted legal hunting occurs only in Montana. The Montana trapping season is monitored and regulated, and there is no information to conclude that the distribution or population numbers of fisher are being negatively impacted directly by the current trapping regimes. The FWS concluded that the best scientific and commercial information available indicates that the fisher in the USNRMs is not now, or in the foreseeable future, threatened by overutilization for commercial, recreational, scientific, or educational purposes.

(C) Disease or predation: There is little known about the impacts of disease in fishers, and there is no information on the incidence of disease specific to fishers in the USNRMs. There is no evidence that healthy adult fishers in suitable habitat are subject to excessive rates of predation or that fisher populations in the USNRMs are impacted by predation. The FWS concluded that the best scientific and commercial information available indicates that the fisher in the USNRMs is not now, or in the foreseeable future, threatened by disease or predation.

(D) The inadequacy of existing regulatory mechanisms: The authority exists under States' laws to manage trapping programs, specifically for fisher, as well as other species. However, the FWS was unaware of any policy or management direction thatwould invoke that authority and apply adaptive management or minimization measures to reduce additional mortality from unintended harvest. The FWS did not consider that the threat of incidental mortality, based on the limited information available, rose to the level of a threat to the species in the foreseeable future, it is not necessary to consider the effectiveness of the relative regulatory mechanism. The FWS concluded that the best scientific and commercial information available indicates that the fisher in the USNRMs is not now, or in the foreseeable future, threatened by the inadequacy of existing regulatory mechanisms.

(E) Other natural or manmade factors affecting its continued existence: Based on the best available information, the FWS has no indication that other natural or anthropogenic factors are likely to significantly threaten the existence of the fisher in the USNRMs. The FWS recognize the inherent vulnerabilities of small populations and restricted geographic range. The impacts of various potential threats can be more pronounced on small or isolated populations, and have identified numerous potential threats occurring on the landscape within the range of the fisher in the USNRMs (see Factor A and B section). However, at this time the FWS does not have information to indicate that these activities pose a threat to the fisher. Additionally, a small population alone is not considered to be a threat to species; rather, it can be a vulnerability that

> can make it more susceptible to threat factors, if they are present. The FWS concluded that the best scientific and commercial information available indicates that the fisher in the USNRMs is not now, or in the foreseeable future, threatened by other natural or anthropogenic factors affecting its continued existence, or that these factors act cumulatively with other potential threats, to the extent that listing under the Act as an endangered or threatened species is warranted at this time.

Lofroth, et al. (2010) summarizes: 1) Fishers are obligate users of tree cavities for reproductive dens throughout the Assessment Area and elsewhere in North America (Powell and Zielinski 1994), 2) Structures used for reproductive dens and resting are typically among the oldest, largest available trees, snags, and logs that provide the types of microstructures (e.g., cavities, mistletoe or rust brooms) used by fishers for denning and resting are relatively rare in forested landscapes, 3) In any given locality, the species of live trees and snags most likely to have heartwood decay and large cavities are more important to fishers than those that do not, 4) Fishers rest every day, but reuse of rest sites is infrequent so each fisher requires an abundance of suitable rest structures within its home range, 5) The most consistent predictor of fisher occurrence at large spatial scales was moderate to high amounts of contiguous canopy cover. Fishers typically occur where canopy cover is greatest, 6) Proximity to natural water courses appears to be an important influence for some fisher distribution and habitat selection, 7) A conservation strategy must recognize the importance of low to moderate elevations, moderate to high forest cover, suitable snow conditions, and large forest structures implemented at appropriately large regional scales, and plan for potential shifts in fisher distribution over time resulting from habitat changes associated with climate change and changes in human development and landscape-use patterns, 8) Fishers are associated with complex forest structure (e.g., dense and layered canopy, snags, large trees, structures associated with forest pathogens, large logs) when active, resting, and denning, 9) Although fishers are not obligates of late-successional forest, many of the elements they need typically only develop in late-successional forests and require many years to form, 10) Fishers are relatively flexible in their use of the forested plant communities and successional stages which benefit fishers in significant ways by providing greater access to seasonal prey abundance, diversity, and availability, and a wider diversity of resting opportunities brought on by the development of complex forest structure that provides the security cover, adequate prey, coarse down wood, and trees and snags with cavities and platforms for needed reproductive dens and rest sites. 11) Although fishers are not necessarily incompatible with forest management, forested landscapes with a history of intensive management (e.g., repeated clearcut logging, hygienic forestry practices, removal of coarse down wood) may no longer provide these attributes.

Schwartz and others (2013) stated that managers can maintain fisher resting habitat by retaining large trees and using forest management practices that aid in the recruitment of trees that achieve the largest sizes. They also recommend increasing structural diversity at these sites. Components of structural diversity needed by fisher include very large trees, snags, fallen logs and stumps as well as seedlings, shrubs, and herbaceous cover (Ruggiero et al. 1994).

Forest carnivore management considerations include an ecosystem level approach, reduction of fragmentation of late-successional forest with less clearcutting, retention of large physical structures commonly associated with late successional forest stands that are important components for denning and foraging, and riparian habitat conservation area management (INFISH) and the Roadless Policy. Current LRMP direction beneficial to fisher includes protecting existing old growth, objectives and standards for retention of large snags and coarse woody debris, reduced emphasis on regeneration harvesting, recruitment of old growth in areas that currently have less than historically, and creation of security habitat improvement with Amendment 19 implementation. The riparian corridors provided by INFISH combined with structural retention in the matrix would be expected to provide adequate habitat connectivity and facilitate movement by fishers. Riparian corridors make excellent corridors to connect preferred habitats (Jones and Garton 1994). Habitat management for fishers emphasizes maintaining sufficient down logs and old-growth forest habitat, and limiting vulnerability to trapping. Extensive roadless and wilderness habitat reduces the risks of mortality attributed to humans such as vehicle collisions, trapping and predator control needs, and reduces the potential negative effects of fragmenting small populations. These attributes are present on the FNF with approximately 69% in wilderness, proposed wilderness, or inventoried roadless lands. Fishers are probably little affected by vegetation management on FNF and in the region (see introduction), while there has been increases in the extent and connectivity of forested habitat.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 19 improves habitat security through motorized access management. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states “Project decisions will not result in loss of species viability or create significant trends towards federal listing.”

Evaluation of Current Situation on NFS Lands

Summary for the fisher and its habitat:

- Potential habitat appears to be plentiful on the FNF and across the Region 1, and the amount of late seral forest fisher habitat is expected to remain within the 75% range of historic range of variability, and much of this in large blocks.
- Is present on the FNF, western Montana, and across much of northern North America with currently no evidence that their habitat or population on the FNF is in decline.
- Regulated trapping in Montana is managed by Montana FWP through scientifically based regulations that sustain furbearer populations.
- FNF Forest Plan Amendment 21 (1999, pg. 9) states “habitat connectivity for old growth associated species would be provided by adding objectives and standards for retention of large live trees, snags, and coarse woody debris throughout the forest matrix, including timber harvest areas. This would provide habitat for foraging and movement of wildlife species….”
- Reduction of fragmentation of late-successional forest, retention of large down logs and snags needed for denning and feeding throughout the forest matrix, application of INFISH standards for riparian areas, and decreased open road densities now provide higher levels of habitat suitability and security.

- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation.
- Riparian, snags/large, down wood, and old-growth management standards are beneficial.
- Vegetation objectives include maintaining or actively restoring landscape composition, structure, and patterns to a condition similar to that expected under natural disturbance and succession regimes, and managing landscapes to develop larger old-growth patch sizes, healthy riparian areas with mosaics of tree age and size classes, and retention of structural elements such as snags and down logs. Current FNF management direction addresses forest characteristics known to be important to fishers.
- Provisions of the HFRA can be used to expedite vegetation treatment, such as mechanical thinning or prescribed fire, which could be beneficial or detrimental to fishers on national forest lands. Projects conducted to reduce fuels could provide a benefit to fishers by creating foraging habitat if needed, promoting the growth of larger trees by decreasing competition, and reducing catastrophic fire risk. While the reverse may be true, the application of the Sensitive Species Policy should direct HFRA projects to improve or maintain suitability of habitats for fishers.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
16b. Grizzly Bear Habitat
20a. Furbearer trapping records from MFWP.
20b. Distribution of forest carnivores.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Other factors outside of the Forest Service's control (such as trapping, predator/pest control, or alteration of private forest habitats) may be associated with fisher population decline, based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the fisher. There would continue to be adequate old growth, riparian habitat, and mid to late seral forest matrix habitat to maintain connectivity of functional home ranges. There appears to be little risk of population loss due to forest management activities and the species will remain present and well distributed across FNF. The FNF should maintain a population within the natural habitat and contribute towards the viability of the species as a whole.

FLAMMULATED OWL (*Otus flammeolus*)

The flammulated owl is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, this owl is an indicator that the needs of other wildlife species that use open-canopy montane forests are met, particularly those associated with Ponderosa pine forests. The flammulated owl is present on FNF, western Montana and across much of western North America. Potential habitat for this species appears to be naturally limited on the FNF but plentiful across much of the Northern Region. Along with several other factors, Forest Plan direction for old growth habitats would not lead to any loss of viability for this species.

Natural History

Flammulated owls prey primarily on moths and grasshoppers, which have a higher abundance and are more easily caught in open forest stands or in grassy openings. These small owls consistently select habitat that combines open forest stands with large trees and snags used for nesting and song perches, occasional clusters of thick understory vegetation for roosting, and adjacent grassland or forest openings that provide optimum habitat for foraging.

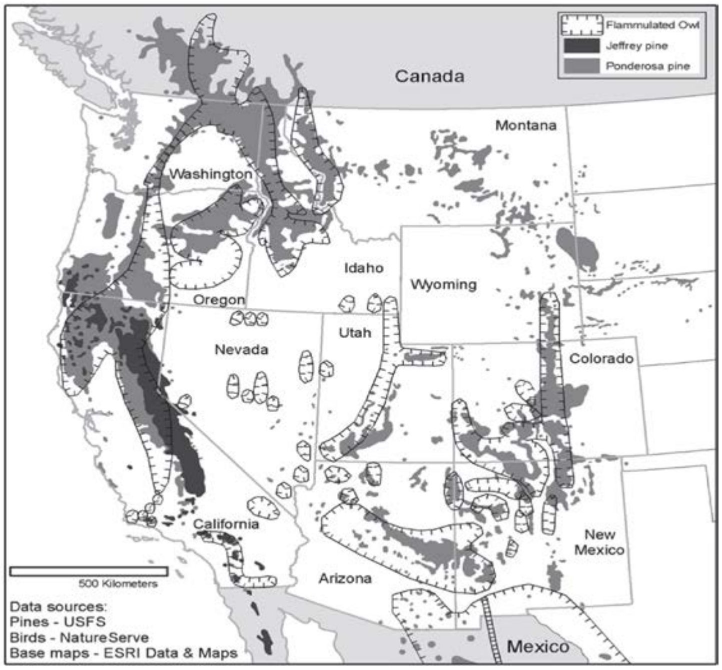
In Montana, flammulated owls are associated with mature and old-growth xeric ponderosa pine/Douglas-fir stands (Holt and Hillis 1987, Wright et al. 1997) and in landscapes with higher proportions of suitable forest and forest with low to moderate canopy closure (Wright et al. 1997). Bull et al. (1990) described 33 flammulated owl nests in northeastern Oregon during 1987-1988. Nest trees were located on ridges and upper slopes with east or south aspects and in stands of ponderosa pine and Douglas-fir or grand fir with ponderosa pine in the overstory. Breeding locations in Region 1 have also been documented in Douglas-fir forest types and occasionally in grand fir, western larch, spruce/fir, lodgepole pine and mature quaking aspen stands (Smucker et al. 2008).

In Colorado, Reynolds and Linkhart (1992) reported nearly all nest records at that time for the flammulated owl were located either in ponderosa pine or Jeffrey pine. Linkhart (2001) summarized a study extending nearly two decades on habitat use and demographics of the flammulated owl. As in earlier studies, flammulated owls preferred open areas of ponderosa pine or ponderosa pine/Douglas-fir. Howie and Ritcey (1987) in British Columbia reported use of Douglas-fir stands as nest sites. Flammulated owl home ranges vary in size depending upon many factors, but generally exceed 14 acres (Samson 2006) with an average of about 37 acres (McCallum 1994).

Population, Habitat, and Distribution

The breeding range of the flammulated owl extends south from southern British Columbia well into Mexico. The geographic range of flammulated owl corresponds closely, but not perfectly, with ponderosa and Jeffrey pine distribution (Figure 3), illustrating the strong positive association between this owl and these two western yellow pines (Nelson, et al. 2009). Flammulated owls leave their breeding areas beginning in August, over-winter in middle America, and return to breeding areas in late April and early May (McCallum 1994a). McCallum (1994b) also mentions the flammulated owl is perhaps the most common raptor of the montane forests of the western United States. One population estimate of 300,000 adult flammulated owls in the US was provided by Barnes (2007), as referenced in Nelson, et al. (2009), based on 92,665 mi^2 of habitat which is about 5 times the US breeding habitat estimated by Nelson, et al. (2009).

Figure 3. Geographic distribution of flammulated owl, ponderosa pine, and Jeffrey pine within Canada, Mexico, and 11 western states, USA (from Nelson, et al. 2009).



Nelson, et al. (2009) used specific habitat characteristics for there habitat estimations and summarized the following characteristics of forest type, size, and density: 1) type—presence of ponderosa pine or Jeffrey pine forest type, 2) size—presence of one or more trees at least 12 inches diameter at breast height or canopy height of at least 30 feet; and 3) density—tree density of 121-283 trees per ac (tph) or canopy cover of 30–80%.

Current estimates of flammulated owl potential breeding habitat in the United States using FIA data were about 18,533 mi² (Nelson, et al. 2009) and current estimates of ponderosa and Jeffrey pine forest types on forest land at 38,082 mi². Although habitat is still well distributed and abundant flammulated owl habitat exists on today's landscape across the western United States, ponderosa pine forests have decreased in abundance and have changed in forest structure during the past century, being lost to settlement and development, logging and wildfire suppression that has resulted in a loss of forest habitat or a change of species composition where ponderosa pine is no longer a dominant component (Nelson, et al. 2009). In addition, the abundance of flammulated owl potential breeding habitat in ponderosa and Jeffrey pines declined substantially over the past five decades.

Habitat modeling done by the Northern Region, USDA Forest Service, based on past research findings and using Forest Inventory and Analysis (FIA) information, produced a summary of habitat estimates for the flammulated owl by National Forest (Samson 2005). At the Region-wide and Ecological Province, habitat for the flammulated owl is abundant and well-distributed in the Northern Region (Table 6). Habitat on the FNF is estimated to be approximately 5,741 acres (0.3%

of the FNF), according to an update to Samson's 2005 paper (USDA-FS 2008b). On the FNF, the stands preferred for nesting by flammulated owls are naturally limited by climate, terrain and soil conditions.

Table 6. Summary of habitat estimates for the flammulated owl in the Northern Region using the Northern Region flammulated owl habitat relationship models and FIA (Samson 2005 with USDA-FS 2008b update).

	National Forests	Model Results (acres)
Northern Rocky Mtn. Ecol. Province	Idaho Panhandle, Clearwater, Flathead, Kootenai, Lolo	105,290
Middle Rocky Mtn. Ecol. Province	Beaverhead-Deerlodge, Bitterroot, Helena, Lewis & Clark, Nez Perce	63,140
Southern Rocky Mtn. Ecol. Province	Custer, Gallatin	14,870
USDA-FS Region 1	**Region Total*** (due to averaging, totals do not add up)	**184,952**

In Montana, the flammulated owl has a state ranking of S3Breeding: "potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas." However, short-term viability of the flammulated owl in the Northern Region is not an issue (Samson 2005) because no scientific evidence exists that the flammulated owl is in decreasing in numbers in Montana; increases in the extent and connectivity of forested habitat have occurred since European settlement; well-distributed and abundant flammulated owl habitat exists on today's landscape; level of timber harvest (8581 ha of 9,045,255 ha or 0.0009% of the forested landscape in the Northern Region) is insignificant. In addition, Samson (2006) showed that the Forests and the Region as a whole had not reached a critical 20-30% threshold of historic habitat remaining on the landscape and forested ecosystems are more extensive now than in historic times. Native habitat is apparently limited based on the species' distribution map from the Montana Heritage Program (MHP 2010) and Samson's 2005 and 2006 paper on the analyses of Northern Region habitat.

The 2005 Forest Service Regional survey effort yielded a total of 243 flammulated owl detections--widely distributed across western Montana and north-central Idaho. The 2005 Forest Service Regional survey effort (Table 7) detected flammulated owls at 8.9% of the points and on 9 of 12 forests around the Region. The forest with the highest occupancy rates was the Nez Perce, followed by the Lolo, Bitterroot, and Helena NFs. Overall regional occupancy rate was 0.388. Dry forest habitat is limited on the FNF. Flammulated owls are believed to have very low relative abundance on the FNF and were detected on 4.9% of the suitable habitat survey plots (FNF), a low rate of detection (Cilimburg 2006). Flammulated owls were located on one transect and at four point locations, giving them a 0.132 probability of presence (Cilimburg 2006). This 2005 field survey effort compliments Samson's 2005 conservation assessment and 2006 habitat estimates from around the Intermountain Region. Personnel at the Avian Science Center in Missoula conducted additional surveys on six national forests in Region 1 in 2008, with similar results, but did not include the FNF due to this owl's low probability of detection on FNF. Monitoring this species in grizzly bear country at night is limited to accessible areas due to safety concerns. This owl is often spooked and may not respond to a playback call in the presence of other owls that are their predators.

Table 7. 2005 Flammulated owl results per National Forest

NATIONAL FOREST	Prob. of presence[1]	Standard error	No. trans FLAM yes	No. points FLAM yes	% pts FLAM yes
Nez Perce	0.747	0.115	16	69	0.22
Lolo	0.655	0.117	18	46	0.17
Bitterroot	0.594	0.123	14	42	0.15
Helena	0.512	0.120	11	41	0.16
Beaverhead-Deerlodge	0.359	0.139	5	10	0.06
Kootenai	0.324	0.090	9	26	0.07
Flathead	0.132	0.126	1	4	0.04
Clearwater	0.120	0.081	2	2	0.01
Idaho Panhandle	0.119	0.124	2	3	0.02
Custer	0	0	0	0	0
Gallatin	0	0	0	0	0
Lewis Clark	0	0	0	0	0
TOTAL	**0.388**		**78**	**243**	**0.089**

[1] maximum likelihood estimates of the probabilities of presence at a transect for each forest.

Elsewhere in Forest Service Region 1, flammulated owls are more abundant. Prior to the 2000 fires, Wright (1996) conducted a two-year study of flammulated owls on the Bitterroot National Forest. Using a "callback survey," she recorded approximately 100 flammulated owl observations. About 90% of these observations were clustered (>3 owls per transect). Wright suggested the clustering is probably a consequence of owls occupying appropriate microhabitat only when the larger area is also suitable (Wright, 1996). Scientists suggest that potential habitat is suitable when it is abundant enough to accommodate a cluster of territories (Casey 2000). Not all stands of ponderosa pine currently provide flammulated owl habitat due to varying micro composition and structure. Perhaps isolated, apparently suitable habitat stands do not contain a large enough area to be occupied by a cluster of birds. In colder regions like Idaho, south and east-facing upper slopes may warm faster, thereby creating more favorable microclimates for insects, the primary prey of flammulated owls (Nelson, et al. 2009).

There have been 643 flammulated owl observations submitted for Montana, with numerous sightings in western Montana within the last 5 years and indirect evidence of breeding well distributed across this portion of the state (MTFWP, 2010).

Many nocturnal and forest interior species are difficult to locate because of low population densities and secretive behavior. One common technique used to detect them is to elicit vocal responses by broadcasting taped owl vocalizations. Flammulated owls are more difficult to detect than many other wildlife species or even other owls, for several reasons. They have a relatively "quiet" call that is difficult to detect at a distance. Since much of the FNF is inaccessible by road or trail, night-time playback calling is highly impractical near many areas of potentially suitable habitat. In addition, flammulated owls may "spook" in response to taped calls or the presence of other owls which are their predators, such as barred owls (Wright, personal communication, 2010).

Threats

The primary threat to flammulated owls may be fire suppression. Virtually every author working with the flammulated owl (Groves et al. 1997, Linkhart 2001, and others) suggests fire suppression has been a negative influence on habitat. Other direct threats to flammulated owls include larger owls, accipiters, and long-tailed weasels, and pesticides.

According to the Partners in Flight Bird Conservation Plan for the Central Rocky Mountains Region (Casey 2000):

> "The habitat that has perhaps been most altered in this region is that dominated by ponderosa pine. These forests were adapted to frequent low-intensity fires, and as a result presented a parkland aspect dominated by very large trees primarily of this single species. Birds particularly adapted to this system include the White-headed Woodpecker and flammulated owl. Harvest of the larger trees, as well as fire suppression, have created opportunities for invasion and co-dominance by Douglas-fir and other trees, radically changing the nature of the forest. Where the other trees have matured, restoration involves mechanical harvest of co-dominant Douglas-fir trees followed by regular fire management."

Timber harvest, fire, and fire suppression can affect this species in both positive and negative ways. Flammulated owls do not occur in recently clearcut stands and large, stand-replacing fire can be detrimental to stands of large trees needed for nesting (Hayward and Verner 1994). However, logging prescriptions or lower-intensity fires which maintain large trees/snags and create or maintain the open conditions needed for feeding with some dense vegetation for roosting by Flammulated owls can be beneficial (Hayward and Verner 1994; McCallum 1994). Flammulated owls have been located in logged stands where numerous large residual trees, snags, and pockets of smaller trees used for roosting were maintained. Wright found that flammulated owls were present in approximately half of the selectively logged stands in her study area south of Missoula, Montana (Wright et al. 1997). Howie and Ritcey (1987), in a British Columbia study, found that most owls occurred in mature and old stands of Douglas-fir with 35 to 65% canopy closure that had been selectively harvested 2-3 decades prior. The quality of logged versus unlogged habitats has not been studied.

Conservation

Conservation efforts include conservation of old-growth forests, continuing monitoring efforts, evaluation of the quality and quantity of suitable but unoccupied habitat, and consideration of the use of prescribed fire near mature forest stands to reduce understory stocking and enhance the shrub component (MFWP 2005). It appears that if owls prefer open forest structure for foraging and dense foliage for roosting, fire suppression has established more than adequate doghair stands for roosting while creating conditions less than suitable for foraging (McCallum 1994a). The FNF LRMP provides the opportunity for restoration of open single-story structures and native disturbance regimes in ponderosa pine communities and dry site Douglas-fir. The objectives and standards for retention of residual trees and large snags, with less emphasis on regeneration harvesting, are expected to be favorable to flammulated owls.

Fire suppression has been a negative influence on flammulated owl habitat in past years, (USDI 2009) but forest restoration projects and fire policy that promotes the natural role of fire in portions of the landscape are now changing past trends.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states "Project decisions will not result in loss of species viability or create significant trends towards federal listing."

Evaluation of Current Situation on NFS Lands

Summary for the flammulated owl and its habitat:

- The flammulated owl is present on FNF, western Montana and across much of western North America,
- Potential habitat appears to be naturally limited on the FNF but plentiful across much of the Northern Region,
- This is a sensitive species and management actions with potential effects undergo an internal biological evaluation, and
- Restoration of open single-story structures and native disturbance regimes in ponderosa pine communities and dry site Douglas-fir is thought to be beneficial.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Other factors outside of the Forest Service's control (such as global climate change, fire suppression activities on private forest lands, or conversion/subdivision of private forests) may have negative effects on flammulated owls. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the flammulated owl. There appears to be little risk of population loss due to forest management activities and the species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

GRAY WOLF (*Canis lupus*)

The gray wolf is a Sensitive Species and Management Indicator Species on the FNF. The wolf is an indicator that the needs of other forest carnivores are met, particularly those that are wide-ranging and associated with a wide variety of habitats, particularly meadow areas. In 2008 the wolf was delisted and relisted with a lawsuit that reversed the FWS decision to delist. In 2009, this species was again removed from the endangered species list, but again relisted as Endangered in 2010 by a U.S. District Court ruling. Congressional action in April 2011 stripped the Endangered Species Act protections from gray wolves in Montana, Idaho, and parts of 3 other states and returned management back to the states. Population viability is not a concern for gray wolves in Montana or across the FNF. Wolves have an extremely high fecundity rate and are highly mobile. Even with a hunting season that harvested 72 wolves, a minimum of 166 pups were documented in 2009 and Montana's population continued to increase. Despite the first legal hunt for wolves in the state there was a 4% increase from 2008, compared to 18% the previous year. The growth rate is slowing down, in part because of the dampening effect of the combination of public harvest and agency control, and because the best habitat is already occupied (Sime, et al. 2010; USDI-FWS 2012 Figure 7a). There are approximately 15-20 well-distributed wolf packs on or near the FNF (Hanauska-Brown, et al. 2012, Figure 2 and Table 1a). The Montana wolf population increased about 15% from 2010 to 2011. Recovery goals have been exceeded across the entire recovery area and the Montana wolf population is secure well above the 10 breeding pair minimum.

Natural History

Wolves in the central Rocky Mountains appear to select landscapes with relatively low elevation, flatter terrain, and close to water and roads. Habitat preferences appear to relate more to prey than to cover. The predominant prey of wolves in the northern Rockies is white-tailed deer, with lesser amounts of moose, elk, beaver, and smaller animals. Ungulate winter ranges, usually located in valley bottoms, are a critical factor for wolf survival. Within their home ranges in and near Glacier National Park, wolves concentrated their hunting in wintering areas of white-tailed deer (Kunkel and Pletscher 2001). Wolves commonly den in undisturbed sites, usually within 400 yards of water. A wolf pack will usually move up to six miles to a number of rendezvous sites, typically meadows, until the pups can travel with adults. Another important habitat component appears to be corridors for travel and dispersal, typically with vegetative cover and shallow snow. Wolves have large home ranges and long distance dispersal capabilities.

Population, Habitat, and Distribution

Gray wolves have a circumpolar range including North America, Europe and Asia. In the lower 48 states, populations are primarily found in the northern Rocky Mountains (Montana, Idaho and Wyoming), and in the eastern Great Lakes states (Minnesota, Wisconsin and Michigan) (USDI-FWS, et al. 2006a).

In 2004 the USDI-FWS et al. (2004) stated "within occupied suitable habitat, enough public land exists so that a delisted wolf population can be safely maintained above recovery levels. Wolf pack numbers at the Forest, Northwest Montana, and Tri-State of Idaho, Montana and Wyoming area clearly indicate that cumulative, broad-scale activities have not limited recovery at any scale. At the end of 2011, there were a minimum of 287 packs (109 breeding pairs) and 1,774 wolves in the

Northern Rockies Distinct Population Segment (DPS) including 797 in CID, 499 in GYA and 431 in NWMT recovery areas (USDI-FWS, et al. 2012). This made 2011 the 11th year in which 30 or more breeding pairs were documented and well distributed within the three-state area. Important suitable wolf habitat is in public ownership and the States and Federal land-management agencies will continue to manage habitat that will provide forage and security for high ungulate populations, sufficient cover for wolf security, and low road density." The recovery goal for wolves in the northern Rocky Mountains was 30 breeding pairs distributed equitably throughout the 3 recovery areas in Montana, Idaho, and Wyoming for 3 years (USDI-FWS 1987).

MFWP monitors wolves. Statewide for Montana during 2011, 130 verified packs of 2 or more wolves yielded a minimum estimate of 653 wolves; 39 packs qualified as a Breeding Pair. This was an increase from an estimate of 566 wolves and 108 packs across the state in 2010. There was a minimum estimate of 372 wolves in 85 packs (23 Breeding Pairs) in the Montana portion of the NWMT recovery area (Hanauska-Brown, et al. 2012). That is an increase from 326 wolves in 68 packs at the end of the year in 2010. There were 18 newly identified packs in 2011. In 2011, we documented a minimum estimate of 147 wolves and 23 packs in the Montana portion of the Central Idaho Experimental Area. This is an increase from the 119 wolves and 21 packs at the end of 2010. There were 7 newly identified packs in 2011. In 2011, in southwestern Montana, the minimum estimate was 139 wolves in 22 verified packs, 10 of which qualified as a breeding pair. This represents a small increase in the minimum population estimate from the 118 wolves and 19 packs in 2010.

Wolves have rapidly re-colonized Montana, Wyoming and Idaho. The gray wolf exhibits no particular habitat preference and new packs in Montana have demonstrated greater tolerance of human presence and disturbance than previously thought characteristic of this species (MFWP 2005). The overall causes and rates of annual wolf mortality vary based upon a wide number of variables. Wolves in higher quality suitable habitat such as remote, forested areas with few livestock, such as National Parks, have higher survival rates (USDI-FWS Federal Register 2006a); wolves in unsuitable habitat and areas without substantial refugia have higher overall mortality rates.

The USFWS conducted a multi-scale assessment for the Northern Rocky Mountain (NRM) segment of the gray wolf population, incorporated by reference **(**Federal Register /Vol. 74, No. 62 /Thursday, April 2, 2009 /Rules and Regulations). This assessment stated:

> "The northwest Montana population segment (NRM DPS) has persisted for nearly 20 years, is robust today, and currently, genetic diversity throughout the NRM DPS is very high. Wolves in northwestern Montana are as genetically diverse as their vast, secure, healthy, contiguous, and connected source populations in Canada; thus, inadequate genetic diversity is not a wolf conservation issue in the NRM at this time. There is more than enough habitat connectivity between occupied wolf habitat in Canada, northwestern Montana, and Idaho to ensure exchange of sufficient numbers of dispersing wolves to maintain demographic and genetic diversity in the NRM wolf metapopulation. We have documented routine movement of radio-collared wolves across the nearly contiguous available suitable habitat between Canada, northwestern Montana, and central Idaho. Wolf dispersal into northwestern Montana from the more stable resident packs in the core protected area (largely the North Fork of the Flathead River along the eastern

edge of Glacier National Park and the few large river drainages in the Bob Marshall Wilderness Complex) and the abundant National Forest Service lands largely used for recreation and timber production rather than livestock production, helps to maintain this segment of the NRM wolf population."

As reported by the USDI-FWS Federal Register (2008) after severe declines, wolf populations can more than double in just two years if mortality is reduced and adequate food is available. Increases of nearly 100% per year have been documented in low density suitable habitat. The literature suggests that in some situations wolf populations can remain stable despite annual human-caused mortality rates ranging from about 30 to 50%. Overall, approximately 23% of the NRM DPS absolute minimum estimated wolf population was removed due to human-causes in 2011 (USDI-FWS, et al., 2012). However, the NRM wolf population still continued to expand at about 24% annually with growth slowing to 8% in 2008 (USDI-FWS 2009a) and in 2011, the NRM DPS minimum wolf population estimate increased slightly (~3%) from 2010 levels (USDI-FWS, et al. 2012,Table 4b). The Montana state Heritage rank for the gray wolf is S4, "Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining".

Threats

Wolf management and recovery is controversial and has been challenged often in the courts by both conservation and industry groups. Wolf conflicts with livestock have fluctuated with wolf population size and prey population density (USDI-FWS Federal Register 2006a). Wolf mortality from agency control of problem wolves is estimated to remove around 10% of the adult radio-collared wolves annually (USDI-FWS Federal Register 2006a). Wolves are illegally killed by shooting and poisoning. It is known wolves are illegally killed on the forest[1]. Radio collar tracking data indicate that illegal killing is as common a cause of wolf death as agency control and also removes around 10% the adult wolf population annually (USDI-FWS Federal Register 2006a). In 2008, 77 out of 238 wolf packs (325) were confirmed involved in livestock or pet deaths. As a result, 264 wolves were lethally removed from the 3 state area (14%). In 2008 one wolf pack, with a home range that included part of the FNF, had lethal action taken against it due to depredation occurring off FNF on private land. The Hog Heaven pack was lethally removed in 2008 after chronic livestock depredations that began in 2007. With 27 wolves killed it was the largest pack recorded. However, by the end of 2008, sign of two wolves was already reported in this area (Sime et al. 2009). In 2010 the Lemonade Springs cattle allotment on the Tally Lake RD had 1 depredation report which was confirmed by a Federal wildlife agent.

The effect of timber harvest, insect epidemics, and wildfire on wolves is best defined by effects on its prey, much of which depend on early seral/structural stage stages interspersed with cover, shelter, and water. Although lesser-used roads and trails can facilitate wolf travel, frequently used roads can reduce wolf habitat security and increase the potential for accidental or illegal mortality

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[1] FWP News Release, October 26, 2009. Man Cited For Killing Two Wolves Out-Of-Season. FWP Wardens cited a Columbia Falls man for killing two wolves during a closed season in Whale Creek in the North Fork Flathead drainage. The wolves were shot and left along the Whale Creek Road the morning of October 9.

(Thiel 1985, Person & Russell 2008). There are a wide range of diseases that may affect the NRM wolf DPS. However, there are no indications that these diseases are of such magnitude that the DPS is in danger of extinction, particularly within the core areas of Idaho, Montana, and Wyoming (USDI-FWS Federal Register 2006a). Roads and trails have a cumulative effect on wolf use as wolves generally avoided areas of high road and trail density (Whittington, et al. 2005).

Conservation

The gray wolf recovery plan (USDI FWS 1997) defined a recovered wolf population as 10 breeding pairs of wolves in each of 3 recovery areas for 3 successive years with some level of movement between areas. According to the USFWS, "by the end of 2009, the Northern Rocky Mountain (NRM) recovery area will contain over 10 breeding pairs and 100 wolves for the fourth consecutive year (2005–2008), and probably has done so for the last seven years (2002–2008)" **(**Federal Register /Vol. 74, No. 62 /Thursday, April 2, 2009 /Rules and Regulations). In response to the increasing population, the FWS published an advanced notice of proposed rule-making (USDI-FWS Federal Register 2006a) that outlines the agency's intent to remove gray wolves in the NRM from the Federal list of threatened and endangered species. Threats will have been reduced or eliminated if all states adopt laws and wolf management plans that FWS believes will adequately conserve wolves (USDI-FWS Federal Register 2007). In 2008 Montana and Idaho adopted laws and management plans (MFWP 2004b) that would conserve a recovered wolf population into the foreseeable future. On February 27, 2008, the USDI-FWS (Federal Register 2008b) announced the *final rule designating the northern rocky mountain population of gray wolf as a distinct population segment and removing this distinct population segment from the federal list of endangered and threatened wildlife*, effective March 28, 2008. After a species or population is delisted, the ESA requires a mandatory, minimum 5-year post-delisting oversight period. That period, during which the USDI-FWS reviews the implementation of state management plans and wolf population status, providing a safety-net to ensure that the species is able to sustain itself without ESA protection. If wolves became threatened again, the USDI-FWS could relist them by emergency order. After delisting, the gray wolf was considered a Forest Service sensitive species. A lawsuit was filed to reverse the FWS 3/28/08 decision and on 7/18/2008 the court granted an injunction that read, "Endangered Species Act protections are hereby reinstated for the northern Rocky Mountain gray wolf pending final resolution of this matter on the merits". The species was again an endangered species and management actions with potential effects underwent consultation with the FWS.

The following year the FWS delisted the northern a portion of the Rocky Mountain gray wolf population again, effective May 4, 2009, thirty days after the publication of the final rule in the *Federal Register* on April 2, 2009. The FWS designated a northern Rocky Mountain DPS that includes all of Montana, Idaho, and Wyoming, the eastern third of Washington and Oregon, and a small corner of north-central Utah. This wolf population will be removed from the protection of the Endangered Species Act [Act], except in Wyoming (USDI-FWS 2009b). Legal hunting of wolves occurred in Idaho and Montana in 2009. On August 5, 2010 a U.S. District Judge ruled that gray wolf populations in Montana and Idaho cannot be considered separately from Wyoming's wolves, putting wolves back on the Endangered species list. This ruling reversed the April 2, 2009 delisting of the gray wolf in Montana (Federal Register /Vol. 74, No. 62, April 2, 2009 /Rules and Regulations). On April 15, 2011 President Obama signed the Department of Defense and Full-Year

Appropriations Act, 2011. A section of that Appropriations Act directed the Secretary of the Interior to reissue within 60 days of enactment the final rule published on April 2, 2009, that identified the Northern Rocky Mountain population of gray wolf as a DPS and to revise the List of Endangered and Threatened Wildlife by removing most of the gray wolves in the DPS. This rule complies with that directive and is effective May 5, 2011 (USDI-FWS 2011).

The most important habitat attributes for wolf pack persistence are forest cover, public land, high elk density, and low livestock density (USDI-FWS Federal Register 2006a). Extensive roadless and wilderness habitat reduces the effects of displacement from high density roads and trails, the risks of mortality due to vehicle collisions and other types of human-related mortalities, and the potential negative effects of fragmenting small populations. These attributes are present on the FNF with approximately 69% in wilderness, proposed wilderness, or inventoried roadless lands. Amendment 19 improves habitat security through motorized access management. By 2008 the open road density had decreased to about 0.4 miles per mi^2 (approx. 1458 miles/3688 mi^2) and only 2500 permitted animal unit months on 111,000 acres (actual numbers less due to 3 allotments in vacant status) limits the negative effects of predator control as a result of damage to livestock permitted on the FNF.

Management direction applicable to the project area from the USDI-FWS includes maintaining an adequate prey base for wolves and minimizing mortality risk for wolves without unnecessary land use restrictions. Gray wolves are also legally protected under the Lacey Act (1901) and State law. Amendment 19 improves habitat security with access management. Forest Plan direction includes II 34-38; Amendments 8, 11, and 12; and Appendix PP. These standards that are listed below:

a. Wolf habitat needed to meet recovery goals includes available prey (especially elk, deer, and moose) and security.
b. Logging activities should not be conducted in or near the following areas at certain times of the year: (a) within one mile radius of known or highly suspected wolf whelping dens and initial rendezvous sites 15 March–1 July; (b) ungulate calving/fawning areas 1 May–15 July and (c) crucial ungulate winter ranges 1 December–15 April. The dates and locations given may vary and should be based on the current ongoing wolf research.
c. Maintain active communications with research organizations and cooperating agencies.
d. Maintain an active public information and education program adressing wolf recovery and management.

Public outreach to increase an awareness and perceptions of wolf biology, conservation, and management is important in the conservation of this species. Public education focused on the gray wolf and other species has been employed on FNF since at least 1988.

<u>Evaluation of Current Situation on NFS Lands</u>

Summary for the gray wolf and its habitat:

- The gray wolf is found throughout FNF, parts of Montana, Idaho and Wyoming and up into Canada and Alaska and over to the Great Lakes,

- Most of the gray wolves in the northern Rocky Mountain Distinct Population Segment has been removed from the federal List of Endangered and Threatened Wildlife,
- Its breeding population in the three-state area continues to grow,
- Wolves are protected by the FNF Forest Plan standards and guidelines (USDA FS 1986).

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

8. White-tailed Deer Populations
9. White-tailed Deer Winter Range
10. Elk and Mule Deer Population
11. Elk and Mule deer Winter Habitat
12. Elk and Mule Deer Winter Range Browse Production
13. Change in Elk Summer Habitat
14. Moose and Mountain Goat Populations

16b. Grizzly Bear Habitat

18. Gray wolf: number of packs, productivity, and known human-caused mortality.

20a. Furbearer trapping records from MFWP.

20b. Distribution of forest carnivores.

21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
54. Open Road Density

The best available scientific and commercial data available indicate that the gray wolf has recovered. On 3/6/09 the USDI-FWS affirmed a 2008 decision to remove wolves from the ESA list in western Great Lakes and the northern Rocky Mountain states of Idaho and Montana and parts of eastern Washington and Oregon. The FWS delisted the northern Rocky Mountain gray wolf population, effective May 4, 2009, thirty days after the publication of the final rule in the *Federal Register* on April 2, 2009. The FWS designated a northern Rocky Mountain wolf Distinct Population Segment (DPS) that includes all of Montana, Idaho, and Wyoming, the eastern third of Washington and Oregon, and a small corner of north-central Utah. This removed from the protection of the Endangered Species Act, except in Wyoming. On August 5, 2010 a U.S. District Judge ruled that gray wolf populations in Montana and Idaho cannot be considered separately from Wyoming's wolves, and ordered wolves back on the federal ESA list. On May 5, 2011, the FWS complied with the April 15, 2011 Department of Defense and Full-Year Appropriations Act of 2011 that identified the Northern Rocky Mountain population of gray wolf as a DPS and to revise the List of Endangered and Threatened Wildlife by removing most of the gray wolves in the DPS.

Other factors outside of the Forest Service’s control (livestock depredation, poaching, ungulate availability, etc.) may have negative effects on the grey wolf. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the gray wolf. There appears to be little risk of population loss due to forest management activities and the species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

GRIZZLY BEAR *(Ursus arctos horribilis)*

The Grizzly bear is a Management Indicator Species on the FNF. Among other species and habitats, the grizzly bear is an indicator that the needs of other forest carnivores are met, particularly those that are wide-ranging and associated with a wide variety of habitats. Grizzly bears occupy nearly all of the FNF, with relatively high densities throughout most of the Northern Continental Divide Ecosystem (NCDE) grizzly bear recovery area. Although it is a federally threatened species, the best available information suggests the grizzly bear population and trend on the FNF and in the NCDE is growing, as well as expanding outside the recovery zone, and that its population is well beyond recovery plan objectives (USDA-FS 2016c). The Forest Service is concurrently amending the forest plans of the Helena, Kootenai, Lewis and Clark, and Lolo National Forests (referred to as the "amendment forests") to incorporate relevant direction from the NCDE Grizzly Bear Conservation Strategy (GBCS; USFWS, 2013b). The Flathead Forest is proposing to incorporate the relevant portions of the NCDE GBCS as part of its plan revision process. Maintaining large areas of secure habitat is important to the survival and reproductive success of grizzly bears, especially females (Mace et al. 1999, Schwartz et al. 2010), and is a major goal of the draft NCDE grizzly bear conservation strategy.

Natural History

Grizzly bears have a large home range and use a wide variety of relatively undisturbed habitats that indicate relatively broad environmental limits (Craighead 1998). The high level of topographic and vegetative diversity allows grizzly bears to effectively use different habitats, leads to their omnivorous or generalist feeding habit, and an adaptable ability to eat a wide variety of plant and animal foods (Schwartz, et al. 2003). Grizzlies in the NCDE use a diverse array of habitats and consume a variety of foods which can vary substantially by location and season (Aune 1994; Mace and Jonkel 1983; Martinka and Kendall 1986; McLellan and Hovey 2001; Servheen, 1983; USDI-FWS, 1993; Waller and Mace 1997, Schwartz et al. 2003). These data suggest there is substantial local food habitat variation by NCDE grizzly bears. Their digestive system is essentially that of a carnivore but they are successful omnivores and in some cases almost complete herbivores (USDI 1993). Mixed shrub fields, seeps, grasslands, timbered side-hill parks, and burned areas are used for feeding and resting. A seasonal elevation gradient is often used, including low-elevation riparian areas, avalanche chutes, and meadows in spring and fall, and higher-elevation habitats such as subalpine forests, alpine tundra, and boulder fields in summer, early fall, and winter. Avalanche chutes provide security and high-value forage throughout the non-denning season (Mace, et al. 1996). Dense timbered habitats are often used for denning and daytime bed sites.

Grizzlies have high metabolic demands during the non-denning season and adequate nutritional quality and quantity are important factors for successful reproduction. Teisberg and others studied grizzly bear population health and body condition, finding that adult females across all ecoregions of the NCDE enter dens at mean fat levels above those thought to be critical for cub production. They stated that there is no evidence to conclude that the widely varying food resources across the NCDE are inadequate to meet the needs of reproductively-active adult females. As opportunistic omnivores, grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg, Madel, Mace, Servheen, & Robbins, 2015).

In the western portion of the NCDE, including the FNF, riparian and wetland habitats (Ruby 2014) and avalanche chutes continue to be important to bears during summer, and autumn (Mace and Waller 1997). Avalanches regularly occur on FNF and adjacent areas of the NCDE, restoring conditions that are favorable for grizzly bears. During summer, grizzlies may feed on army cutworm moths and ladybird beetles on the rocky talus areas at high elevations of FNF (Aune & Kasworm 1989, Craighead & Mitchell 1982, Servheen 1983). Once berries become available in the summer, grizzlies consume a wide variety on FNF, primarily huckleberries, buffaloberries, serviceberries, hawthorn berries, and chokecherries (LeFranc Jr. et al. 1987, Mace and Jonkel 1986, Martinka and Kendall 1986, Servheen 1981). Prior to the spread of white pine blister rust, grizzlies in the NCDE fed on whitebark pine seeds from late summer through fall when and where they were available (Aune and Kasworm 1989, Kendall and Arno 1990, Mace and Jonkel 1986). Grizzly bears are also known to feed on animals and hunter-discarded gut piles, especially in the fall. Teisberg and others found that fall diets of NCDE grizzly bears consist of higher amounts of meat (32% for adult males, 21% for adult females) (Teisberg et al., 2015).

Grizzly bear presence in the lower 48 states is most associated with wilderness and roadless settings such as provided by the NCDE and the Greater Yellowstone Ecosystem. However, these wild areas are not large enough to reliably assure population persistence, and adjacent roaded land provides habitat for additional bears. With these roaded lands comes increased risks from hunting, poaching, and collisions, as roads and their associated traffic are known to lessen the effectiveness and use of adjacent habitat and expose bears that do travel on or near them to elevated risks from human-caused mortality (McLellan and Shackleton 1988, Kasworm and Manley 1990, Mace and Waller 1997). The least amount of security core area used in the South Fork study was roughly 55% (USDA-FS 1994). Vast areas of no or few roads and moist open-land habitats in combination with timbered areas are essential for optimum grizzly bear habitat.

Grizzly bear home ranges overlap and change seasonally, annually, and with reproductive status. The grizzly bear population density estimate inside Glacier National Park is approximately one bear per 8,154 acres (Kendall et al., 2008). Mace and Roberts (2012) evaluated home ranges of 34 female grizzly bears that lived in or adjacent to Glacier Park, based upon data collected from 2004-2011. Most home ranges (59%) straddled the Park boundary, overlapping lands managed by the FNF, the Lewis and Clark/Helena National Forest, and the Blackfeet tribe. Home ranges were, on average, smallest for bears that lived 100% within the Park, and larger for females that straddled the Park boundary.

Most grizzly bear dens in the NCDE are located at elevations above 6,400 feet (Mace & Waller, 1997). The average elevation of 252 grizzly bear dens in the NCDE ranged from 6,427 to 6,906 feet (USDA-FS 2016b). It has been estimated that about 47% (1,648,000 acres) of National Forest System lands in the NCDE provides potential denning habitat (Mace and Roberts, 2014, Mace, MFWP, unpublished data, 2014). Denning habitat is not likely to be a limiting factor for grizzly bears in this area (Mace and Waller 1997, USFWS, 2013b), and new dens were used each year.

On the west side of the NCDE, 52 separate females monitored during 1987-88 to 2012-13 entered their dens between the first week of October and the fourth week of November, with most occurring the fourth week of October; 72 females emerged in the spring between the third week of March and the fourth week of May, with most occurring during the second week of April (Mace and Roberts 2014). Among the different age and sex classes, females with cubs entered their dens earlier and emerged later.

Grizzly bears have an extremely low reproductive rate. Usually, 2 cubs are born in the den and spend the next 2 years with the mother. Except for groups of females with cubs, grizzly bears are solitary animals but will often concentrate at rich feeding sites.

Population, Habitat, and Distribution

Distribution - The historic distribution of grizzly bears ranged throughout much of Europe, Asia, and western North America and is now found in extremely small numbers in most of these areas. Populations in Alaska and western Canada remain fairly high and stable. Many populations in the continental United States have been extirpated. There are around 1200 – 1500 grizzly bears distributed in Washington, Idaho, Montana and Wyoming. In Montana, grizzlies were associated with large buffalo herds, but occurred in forested areas and high mountains as well. Today, the grizzly mainly occupies high mountain wilderness areas and associated foothills in western and south central Montana (Greater Yellowstone, NCDE and Cabinet-Yaak Ecosystems) but grizzlies are also known to use low-elevation habitats, notably along the east front of the Rocky Mountains, and along the base of the Mission Mountains. Grizzly bears exist in four identified recovery zones: Northern Continental Divide, Greater Yellowstone, Cabinet-Yaak, and Selkirk. Of these, the NCDE supports the largest grizzly bear population (USDA-FS 2016c). The NCDE population of grizzly bears is contiguous with grizzly bears in Canada, resulting in high genetic diversity (Proctor et al., 2012).

The NCDE encompasses 5.7 million acres, of which 1.7 million acres is wilderness on the Flathead, Lolo, Lewis and Clark, and Helena National Forests. In total, the FNF comprises nearly 40% of the NCDE grizzly bear recovery area or primary conservation area (USFWS 2013b) and includes about 1.1 million acres of Wilderness. Add another 962,000 acres of Glacier National Park, which contains highest quality grizzly bear habitat, and 91,000 acres of tribal wilderness, and nearly half (48 %) of the NCDE is essentially roadless or free of motorized use. The Salish Range and Island Unit parts of FNF, although largely roaded and outside the NCDE, do also support female grizzly bears with cubs (Mace and Roberts 2014, Costello et al. 2016).

To facilitate the assessment of grizzly bear population recovery objectives, the NCDE grizzly bear recovery zone was subdivided into smaller units called bear management units. Twenty-three bear management units were delineated in the NCDE and 12 of these are located on or partially on the FNF. A recovery objective is to have 21 of 23 Bear Management Units in the NCDE occupied by females with cubs. There is wide distribution of grizzly bears across the NCDE bear management units (Kendall et al., 2009; Mace & Roberts, 2011). Mace and Roberts (2014) mapped the distribution of grizzly bears in the NCDE. Costello and others (2016) evaluated occupancy of the 23 bear management units in the NCDE by females with offspring during 2004–2014. Using the 6-

year running tally as set forth in the Recovery Plan (USFWS, 1993), they documented full occupancy of the recovery zone starting in 2009 and continuing until 2014.

Genetic connectivity of grizzly bear populations has been examined at multiple scales. At an international scale, Proctor and others (2012) studied connectivity between the U.S. and Canada, using genetic testing and movement data from radio-collared grizzly bears, with data gathered between 1979 and 2007. Both male and female grizzlies moved freely across the US/Canadian border on the northern edge of the NCDE, including FNF. They concluded there is currently little risk of significant reduction in the present high levels of genetic diversity in the NCDE grizzly bear population (Proctor et al., 2012). Within the NCDE, few barriers to grizzly bear genetic exchange appear to exist. Both male and female movements have been documented across existing highway corridors. Based on MFWP, Glacier NP, and FWS telemetry data, it is well established that grizzly bears frequently cross State Highway 83 and move between the Swan and Mission Mountains, across U.S. Highway 2 between FNF and Glacier National Park, and across U.S. Highway 93 between the NCDE and the Salish Range. Numerous movements between the NCDE and Canada and the Cabinet-Yaak Ecosystem have also been documented. Researchers concluded that habitat connectivity is within levels that ensure both demographic and genetic connectivity (Miller & Waits 2003; Waller & Servheen 2005).

Population – In 2011 the USFWS completed a 5-year status review and estimated that the overall population size had increased to about 1,500 grizzly bears across the lower 48 States (USFWS, 2011b).

MFWP and USGS have been cooperatively monitoring grizzly population and trend since at least 2005. One recovery criteria to meet within the Grizzly Bear Recovery Plan (USDI-FWS 1993) identifies a minimum NCDE grizzly bear population target of 391 (211 bears outside Glacier National Park and 180 bears inside the park). This compares to a minimum NCDE estimate of 306 bears at the time of the 1993 Revised Grizzly Bear Recovery Plan. The minimum NCDE grizzly bear density estimate was 492-687 in 1993 (MFWP 1993b). Adjusted for lack of study area closure the average number of grizzly bears in 1998 was 241 and in 2000 the average number of grizzly bears was also 241 (Kendall, et al. 2008). Numbers not adjusted for geographic closure were 319 in 1998 and 336 in 2000. As of 2004, Kendall and others (2009) confirmed that the known number of individual bears exceeded recovery goals and estimated with a high degree of confidence that 765 grizzly bears (range of 715 to 831) make their home in the NCDE. In 2014, the population estimate for the NCDE is 960 grizzly bears with an estimated population growth rate is 2.3% per year (Costello et al., 2016). Overall, the genetic health and diversity of the population is good (Kendall, et al. 2009).

The best current information suggests that the grizzly bear population on the FNF and NCDE is expanding its range outside of the recovery zone and has a population beyond recovery plan levels (USDA-FS 2002, USDI-FWS 2005b, USDA-FS 2006c, Kendall et al. 2009, Costello et al. 2016). The USDI-FWS (2005b) concluded it is unlikely that movement of grizzly bears from inside to outside the recovery zone is driven by displacement from roads, human development, or activity within the recovery zone. Grizzly bears are apparently dispersing in all directions outside the recovery zone except the highly developed area of Flathead Lake to the west (Wittinger 2000, Kendall et al. 2009). Their current distribution is 21,313 square miles, covering considerably more than the entire NCDE (Costello et al., 2016).

The FNF was also an active participant in the USGS Northern Continental Divide study. This was designed to derive a grizzly bear population estimate for the entire NCDE based on a DNA sampling technique. Other cooperators in this study included Glacier National Park, U.S. Geological Survey, Blackfoot Tribe, Kootenai and Lewis and Clark, and Helena National Forests, Montana Fish, Wildlife, and Parks, and Montana Department of Natural Resources and Conservation. The Northern Divide Grizzly Bear Project identified 563 individual grizzly bears alive in the greater NCDE during the summer of 2004 through genetic analysis of noninvasive hair sampling at baited and unbaited barbed wired hair collection sites (USGS 2008). With a high degree of confidence the NCDE grizzly bear population estimate is 765 animals, with a range reliably estimated to be between 715 and 831 individuals (Kendall et al. 2009). Both the raw count of 563 grizzly bears and a total population estimate of 765 for 2004 illustrate the conservative nature of the recovery plan minimum population estimate of 304 grizzly bears in 2004. The DNA-based estimate is scientifically robust, and is more than two times the recovery plan estimate.

Estimating population trend is not easy and takes many years to achieve higher degrees of scientific confidence. Trend reported in the Swan Mountains study was based on a small subset of the NCDE with few bears. Although information is limited and not statistically analyzed, the USDI-FWS (2005b, 2009, and 2014b) found no compelling evidence to support a declining NCDE grizzly bear population. Kendall et al. (2009) captured more females (62:38) compared to males during the 2004 USGS DNA study. The USDI-FWS (2005b) wrote, the Swan Mountains research indicated a tenuous finite rate of increase of 0.977 for grizzly bears in the study area related to high female mortality (Mace and Waller 1998). However, they concluded the study area population was stable, or experiencing an "exceedingly" slow population decline and concluded the population was probably stable based on multiple lines of evidence, including vital rates, density and occupancy of grizzly bears on the FNF multiple-use zone. A NCDE-wide population trend study is ongoing to compliment the 2004 DNA population study. Updated trend monitoring via telemetry reveals a 2% rate of population increase (Costello et al. 2016). Interim results of Kendall's work released in late 2016 indicate that genetic data collected in 2004, 2009, 2010, 2011, and 2012 reveal a 6% rate of population increase when averaged across the NCDE.

Grizzly bear mortality and survival in the NCDE affects population growth and is influenced by age, sex, reproductive status, and home range location (e.g., proximity to human developments). Mortalities have a variety of causes and fluctuate from year to year, but despite mortalities, the survival rate for adult females (the most important group affecting population trend), is high at 0.947: with a 95% confidence interval of 0.919–0.972 (Costello et al., 2016).

In the NCDE, the most frequent known causes of documented human-caused mortalities of independent-aged grizzly bears during 2004-2014 were listed as management removals, poaching/malicious kills, and defense of life. Accounting for the fact that management removals were documented with 100% accuracy, whereas other deaths often go unreported, Costello et al. (2016) estimated that poaching/malicious kills likely accounted for the highest proportion of total independent bear mortality (27%), followed by management removals (16%), illegal defense of property (11%), and natural causes (9%). The majority of management removals result from conflicts at sites associated with frequent or permanent human presence (USFWS, 2013b). Unsecured grizzly bear attractants on private lands such as chicken coops, garbage, human foods, pet/livestock foods, bird food, livestock carcasses, wildlife carcasses, barbeque grills, compost piles, orchard fruits, or vegetable gardens are usually the source of these conflicts. Walters and Holling (1990) stated that managing human-caused mortality, monitoring both population and habitat parameters (e.g., road access), and responding when necessary with adaptive management, are the best ways to ensure a healthy grizzly population.

Grizzly bear densities within the NCDE primary conservation area vary, but are generally highest in Glacier National Park and on adjacent national forest lands (including FNF), decreasing toward the southern portion of the ecosystem (Kendall et al., 2009).

Habitat – The NCDE recovery zone is approximately 5.7 million acres, with bears occupying at least another 2.5 million acres beyond the recovery zone for 8.2 million acres (Kendall et al. 2009). The 5.7 million acres include NFS (60%), Glacier NP (19%), State (4%), Tribal (7%), private (10%), and other (<0.5%) lands. The FNF has about 2.1 million acres in the NCDE (about 37% of the recovery zone). Close to 30% of the NCDE land area, 1.7 million acres, is designated wilderness. Wilderness, plus 962,000 acres of Glacier NP which contains the highest quality of virtually unroaded grizzly bear habitat, plus 91,000 acres of tribal wilderness, comprise nearly half (48%) of the NCDE in essentially roadless or free of motorized use lands (Ake, pers. comm., 2005). Approximately 69% of the FNF is managed as wilderness, proposed wilderness, or inventoried roadless as is much of the rest of the NCDE recovery zone.

The FNF within the grizzly bear recovery area includes portions of the Swan Valley, the North, South and Middle Forks of the Flathead River, and portions of the Stillwater River drainage where Plum Creek Timber Company, Montana Department of Natural Resources and Conservation, and small private lands account for substantial land ownership. In addition, the South Fork, Middle Fork, and Swan River drainages contain substantial amount of Wilderness and other roadless areas. All of these drainages and land management areas play an important role in determining and describing grizzly bear management and habitat suitability on the FNF.

The basic scale for an evaluation of potential effects of access management and vegetation management project decisions on grizzly bears occurs at the Bear Management Unit (BMU) subunit level. Subunits approximate an adult female grizzly bear home range (roughly 49 square miles). Subunits on the FNF were delineated to include a distribution of habitat by season and elevation, as recommended by the Interagency Grizzly Bear Committee (IGBC 1994). 73 subunits include FNF lands of which 70 have sufficient NFS lands for evaluating FNF management activities. NFS ownership ranges from 37% to 100% within the 70 subunits. Approximately 90% of the subunits are NFS lands and about 10% (2.8% State; 7.5% private) are non-federal lands. Of these 70 subunits, 16 occur entirely within designated wilderness, and are not subject to land management actions such as timber harvest and road construction.

The FNF was stratified into grizzly bear Management Situations 1, 2, and 3 habitat (MS1, MS2, MS3) pursuant to [51 Federal Register (42863), Nov. 26, 1986] (IGBC Guidelines). MS1 has

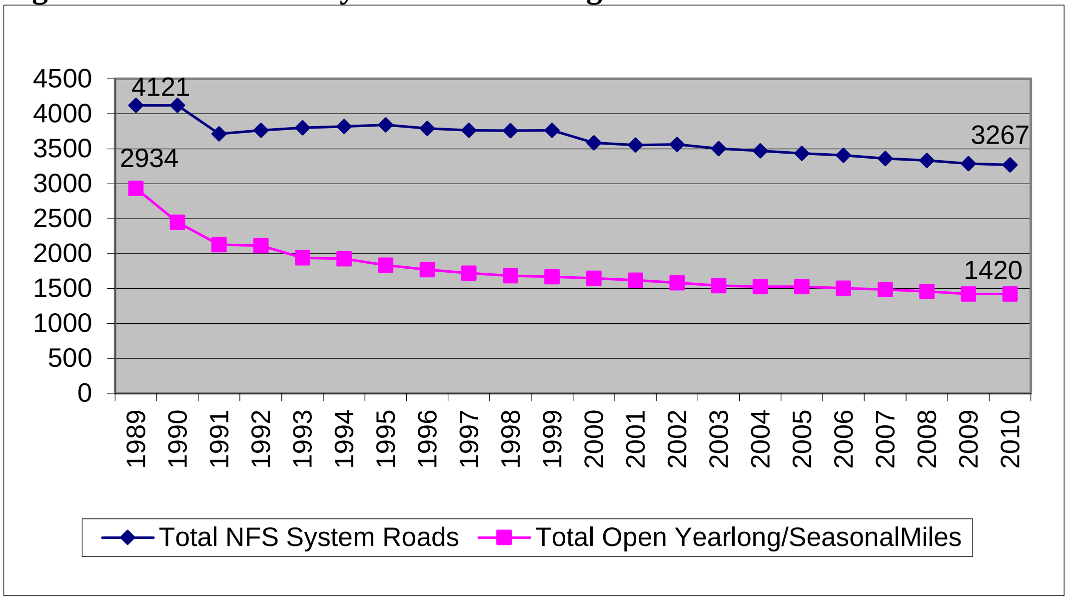
2,022,688 acres, MS2 has 99,418 acres and MS3 has 12,614 acres of FNF lands in the NCDE recovery zone (USDA-FS 2016c). MS1 objectives are to provide high-quality habitat for seasonal foraging needs, free-ranging movement and dispersal of resident grizzly bears, and low risk of mortality due to human/bear conflicts. The IGBC guidelines provide for vegetation management projects and activities within MS1:

> "Grizzly habitat maintenance and improvement, and grizzly-human conflict minimization will receive the highest management priority. Management decisions will favor the needs of the grizzly bear when grizzly habitat and other land use values compete. Land uses which can affect grizzlies and/or their habitat will be made compatible with grizzly needs or such uses will be disallowed or eliminated. Grizzly-human conflicts will be resolved in favor of grizzlies unless the bear involved is determined to be a nuisance. Nuisance bears may be controlled through either relocation or removal but only if such control would result in a more natural free-ranging grizzly population and all reasonable measures have been taken to protect the bear and/or its habitat (including area closures and/or activity curtailments)."

Objectives for MS2 are to provide adequate habitat conditions for short-term occupancy, movement and dispersal, and low risk of mortality due to human/bear conflicts. Objectives for MS3 are to discourage occupancy by grizzly bears and to minimize risk of human/bear conflicts.

At its peak in the late 1980s, the FNF had about 2934 miles of open road density (Figure 4). This was close to 0.8 miles of road per mi^2 (approx. 2934 miles/3688 mi^2). By 1995, the FNF had an open road density of about 0.5 miles per mi^2 (approx. 1924 miles/3688 mi^2). From the end of 1994 to the end of 2015 over 730 miles total miles of system road were decommissioned. About 348 miles of road open with no restrictions was also decreased between 1995 and 2010. By 2010 the open road density had decreased to about 0.4 miles per mi^2 (approx. 1420 miles/3688 mi^2). Additional seasonal and yearlong restrictions to existing system roads have also occurred during this time period. These comparisons are more difficult to tease out now that the former Plum Creek Timber Company lands and roads have come under Forest jurisdiction resulting in road miles increases after years of decreases.

Figure 4. Flathead NF System Road Mileage.



Standards for motorized access density and security core habitat were established for grizzly bear management within the roaded portions of the recovery zone located on the FNF based on the “South Fork” study (Mace and Weller 1997). In 1995, Amendment 19 (A-19) to the FNF Forest Plan was developed to provide direction concerning levels of open roads, total roads, and secure or “core” habitat that would contribute to the recovery and conservation of grizzly bears. A-19 applies to 54 bear management subunits. The remaining 16 subunits are not subject to A-19 because they are wilderness and road management is not an issue. A-19 also does not apply to the Salish Mountains and Island Units portions of FNF, because they are outside the NCDE Recovery Area, nor to 3 subunits that have very small amounts of USFS land.

A-19 required that in each bear management subunit with >75% USFS lands, “there will be no net increase in Total Motorized Access Density (TMAD) greater than 2 miles per square mile, no net increase in Open Motorized Access Density (OMAD) greater than 1 mile per square mile, and no net decrease in the amount or size of security core area.” Within each subunit, the maximum level allowable for open and total roads was 19% and the minimum level allowable for core habitat is 68%, commonly referred to as the “19/19/68” rule. This direction is described in the Decision Notice for Amendment 19 (USDA-FS 1995b) and stands for all subunits unless site-specifically amended.

Conditions on FNF have changed since A-19 was adopted. At that time, there were 14 subunits that had <75% national forest ownership. These subunits were not required to meet the 19/19/68 rule, but were managed with the additional guidance of the Swan Valley Grizzly Bear Conservation Agreement. Through the Legacy Project, the vast majority of these lands have become Federal (USFS) or State (DNRC) owned, and any lands that were sold to private owners have safeguards (e.g., conservation agreements) attached to them so that the integrity of wildlife habitat is maintained. FNF acquired about 45,000 acres of former Plum Creek Timber Company lands in the

Swan Valley, changing 7 subunits to >75% NFS lands (Buck Holland, Cold Jim, Glacier Loon, Hemlock Elk, Lion Creek, Meadow Smith, and Piper Creek). On FNF lands, a recent court decision on a specific project determined that A-19's objectives for 19/19/68 would apply to the Glacier Loon and Buck Holland subunits.

In 2011, the Montana Department of Natural Resources and Conservation in conjunction with USFWS completed a habitat conservation plan, which has a 50-year term. This is a comprehensive program to conserve federally listed species and minimize incidental take during ongoing forest management activities in western Montana. Within the area delineated as the primary conservation area, zone 1 and zone 2, the Montana Department of Natural Resources and Conservation manages about 574,000 acres of state trust lands. Of this, approximately 204,000 acres are located within the NCDE. On all lands under the habitat conservation plan, the Montana Department of Natural Resources and Conservation is committed to minimizing construction of new open roads in riparian area wetlands and avalanche chutes. Motorized activities are suspended within 0.6 mi of a known active grizzly bear den. Visual cover is retained in riparian and wetland areas. Information is provided to all contractors and training is provided to employees about living and working in bear habitat. Additional protective measures apply to the NCDE (USDA-FS 2016b). The transportation plan for the Swan River State Forest under the HCP would cap new permanent roads at 70 miles (none open to the public), allowed a minimal net increase in linear open road miles, and called for an additional 41 miles of road to restrict commercial forest activities during the spring season. The Montana Department of Natural Resources has no commitments to manage secure core habitat for grizzly bears on the Swan River State Forest.

1995, 2000, and 2015 forest-wide conditions for security core are provided below (Table 8a). Most of the increased core was created by road decommissioning and placing permanent barriers on roads in subunits where timber or fuel management projects have facilitated habitat improvement projects. Most of these actions occurred where the FNF manages more than 75% of a subunit. Major improvements in core have also occurred in some subunits where the FNF manages less than 75% of the land but these gains are sometimes offset by corporate or state management actions. *Note that between 2010 and 2015, the number of subunits having >75% USFS lands increased from 47 to 54.* When trying to compare between these dates, remember that:

- CORE is based on all state, federal, and large timber company lands. We gained NFS lands through the Montana Legacy Project in the Swan Valley, but the lands used for these calculations did not change.
- CORE decreased in the primarily wilderness subunits between 2010 and 2015 as one trail is now recognized as high use non-motorized.
- The core percentage in subunits with >75% NFS lands decreased between 2010 and 2015 because this category gained subunits that did not have a lot of security core.
- The core percentage in subunits with <75% NFS lands decreased between 2010 and 2015 because the subunits not gained through the Legacy Project had less security core than the subunits that switched to >75%.
- Private land and large lake acres are not included in these summaries.

Table 8a. Existing grizzly bear security core acres (and %s) on the Flathead National Forest. *Note that between 2010 and 2015, the number of subunits having >75% USFS lands increased, making it appear that security core was reduced.*

	1995	2010	2015
A-19 Subunits with ≥75% NFS lands (In 2013, increased from 47 to 54)	662,327 (58%)	800,823 (71%)	920,496 (68%)
A-19 Subunits with <75% NFS lands (In 2013, decreased from 14 to 7)	161,194 (39%)	165,075 (41%)	64,805 (34%)
Total of A-19 subunits (70 subunits)	823,521 (53%)	965,898 (63%)	985,302 (64%)
Primarily wilderness subunits (16 subunits)	578,405 (85%)	616,209 (92%)	614,424 (90%)
Total of all subunits except the 3 with minor FS ownership	1,401,926 (63%)	1,582,107 (72%)	1,599,726 (72%)

Both natural and human influences that affect habitat effectiveness must be monitored. Examples of human activities that are monitored to assess habitat effectiveness and the changes in habitat due to human activities include miles of open road and total road miles, cover/non-cover ratios, backcountry use days, vehicle use on open roads, and types of structures or facilities. Examples of natural influences are forest succession over time or events such as wildfire that influence the types and amounts of available forage. Cumulative Effects Analysis (CEA) implemented through the Cumulative Effects Model (CEM) is an assessment of how the combination of natural processes and events, and human activities cause resources and environmental conditions in an area to change over time. A CEA results in an assessment of harmful, neutral, or beneficial effects to grizzly bear habitat, and thus changes in habitat effectiveness brought on by various natural and human variables. A 1998 CEM baseline was completed. An update to the CEM (Table 8b) was completed in 2008 using 2005 land imagery.

Table 8b. CEM results for grizzly bear BMUs on the Flathead N. F.

BMUs	2005			% FNF	Comments
Up NF Flathead	Spring	Summer	Fall	47%	Includes GNP, Moose, Redbench, Robert Fires
HV	25.50	18.13	22.06		
HE	20.75	13.57	17.95		
Difference %*	18.6	25.2	18.6		
Low NF Flathead	Spring	Summer	Fall	32%	Includes GNP, Robert Fire
HV	27.65	18.81	21.56		
HE	21.91	13.41	16.72		
Difference %	20.8	28.7	22.4		
Low MF Flathead	Spring	Summer	Fall	23%	Mostly GNP, wilderness, recent fire
HV	25.88	21.08	25.43		
HE	23.97	18.22	22.91		
Difference %	7.4	13.6	9.9		
Hungry Horse	Spring	Summer	Fall	85%	Flathead Valley east towards So. Fork
HV	29.39	20.55	23.45		
HE	19.62	12.94	16.43		
Difference %	33.2	37.0	29.9		
Sullivan	Spring	Summer	Fall	87%	Highway 83 east towards So Fork

BMUs	2005			% FNF	Comments
HV	30.38	24.50	27.77		
HE	23.76	17.03	21.21		
Difference %	21.8	30.5	23.6		
Up MF Flathead	Spring	Summer	Fall	99%	Mostly wilderness
HV	26.62	26.14	31.84		
HE	25.03	20.69	27.05		
Difference %	6.0	20.9	15.0		
Continental Div.	Spring	Summer	Fall	100%	All wilderness
HV	20.80	19.55	27.93		
HE	20.73	15.74	24.35		
Difference %	0.3	19.5	12.8		
Bunker	Spring	Summer	Fall	83%	Hwy 83 east to So. Fork, Part wilderness
HV	25.72	19.35	24.71		
HE	21.15	14.23	19.99		
Difference %	17.8	26.5	19.1		
Big Salmon	Spring	Summer	Fall	92%	Hwy 83 east to So. Fork, much wilderness, recent fires
HV	21.49	16.05	23.22		
HE	18.56	12.66	19.92		
Difference %	13.6	21.1	14.2		
Up SF Flathead	Spring	Summer	Fall	88%	Mostly wilderness, recent fires
HV	19.82	17.62	26.00		
HE	18.82	13.45	22.09		
Difference %	5.1	23.6	15.0		
Mission Range	Spring	Summer	Fall	49%	Tribal land, PCTC, Hwy 93-83, Crazy Horse Fire
HV	25.89	18.34	23.56		
HE	18.59	11.78	17.75		
Difference %	28.2	35.8	24.7		

*Difference % is percent loss of habitat quality potential. Calculated by (1 – (HE/HV)).

The CEM results reflect changes in greenness of vegetation brought about by fire or other vegetation management, access management decisions, and human facilities. BMUs within or adjacent to areas that have experienced large population growth and subsequent development and infrastructure may result in a negative change in habitat values. The CEM calculation process indicates that vegetative habitat conditions (HV) are suitable across FNF, while human activity effects appear highest in areas where roads, residences, and other human concentration sites are present. The CEM is just one of the tools to review land use management effects. The level of activities mapped for CEM if looked at by their sheer numbers, distribution, and level of use (roads) might be used to gauge the increase/decrease of human activity impacts over a landscape view.

Some members of the public have expressed concern that the USFS has not calculated the carrying capacity or food production capability of its lands (USDA-FS 2016c). Carrying capacity or food production cannot be calculated for an omnivorous and opportunistic species such as the grizzly because they eat a wide variety of foods with constantly changing availability (USFWS 2013b). Habitat on the FNF provides high diversity of bear foods that meet the needs of grizzly bears as the seasons and available foods change, so they are not reliant on any one food. The varying climate, topography, and vegetative conditions on and near the FNF provide for a wide variety of habitats and foods to support grizzly bears (USDA-FS 2016c).

McLellan studied the interaction of roads, human activities, and food sources for grizzly bears over a 30-year time period, in a multiple-use landscape in British Columbia that had high levels of human activity (including logging, gas exploration, and grizzly bear hunting). McClellan stated that a significant implication of his study is that the abundance of a high-energy food source growing in undisturbed portions of his study area enabled the grizzly bear population to increase in spite of intense industrial development and with the highest density of hunter-killed grizzly bears in British Columbia. He stressed that managers should identify which high-energy foods are important in various ecosystems and try to maintain or enhance these foods while reducing human access into habitats where they are abundant (McLellan, 2015).

In northwest Montana, production of berries is affected by forest canopy cover, temperature, and soil moisture conditions, which can vary considerably from low to high elevations and from year to year. Because most of FNF is heavily forested, wildfire, timber harvest, and other vegetation management activities that affect canopy cover also affect grizzly bear food production. Prolonged drought (that can increase acres burned by wildfire and reduce production of some species of berries) has also occurred during the time period that the grizzly bear population has recovered and grizzlies have adjusted to these changes affecting food availability (USDA-FS 2016c). This is also the case with the decline in whitebark pine due to blister rust, where, despite this loss, the grizzly bear population is increasing, illustrating the flexibility of grizzly bear diets and high habitat diversity in the NCDE (USFWS, 2013b).

For additional information, see the “Habitat Management” section below under grizzly bear Conservation.

Threats

Grizzly bears require large areas of undisturbed habitat to avoid conflicts with humans. Their drastic historic range and population decline is primarily associated with excessive mortality and habitat loss from direct and indirect human encroachment. Oil and gas development, recreational development, improper livestock grazing, poaching, excessive roaded access, and eroding of habitat for economic values are factors believed to be responsible for the grizzlies’ threatened status (USDI 1993). Mortality occurs in all parts of the NCDE with most mortalities occurring on private lands and associated with human site conflicts which includes vehicle mortality. Sources of direct mortality, as reported in Costello et al. 2016, are summarized above. Since 1995, access changes and food storage orders have contributed to improved conditions for grizzly bears on the FNF, along with other measures described below. Nevertheless, there has been an increase in known human-caused or management-related mortality that has been associated more with rural roaded areas and primarily on private property adjacent to national forests. Natural mortality in rare, relatively secretive animals such as grizzlies can be extremely difficult to document or quantify. Starvation and mortality in dens during food shortages have been surmised, but have not been documented as a major mortality factor.

Displacement from preferred habitats may significantly modify normal grizzly bear behavior patterns (USDI-FWS 2005b, 2014b). As animals that are highly dependent upon learned habitat, displacement into unknown territory (such as subadult dispersal) may lead to submarginal nutrition, reduced reproduction, or greater exposure to adult predatory bears or human food sources, which can lead to human-caused mortality. Grizzly bears are typically independent and vary in their responses to disturbance according to type of activity, season, habitat quality, and bear social or density conditions (McLellan and Shackleton 1989). They report most bear populations appear to be limited by human predation, and habitat quality, but bear density could also be regulated by socially induced dispersal. Bears subjected to disturbance can choose to remain or leave, and both have costs (McLellan and Shackleton 1989). If the bear stays, death as a result of human conflict may occur. If it moves away, energy is expended in search of a new and perhaps less productive area. If the population is at carrying capacity, a bear that moves risks the threat of social intolerance from other bears or competition for limited resources. In years of high food abundance, displacement from human activities may have little cost to the bear, but if the bear remains, threats associated by habitat alteration, food/garbage management, and improved road access may increase. Compared to mortality, the actual effects of displacement are much harder to determine due to individuality of each bear and circumstances of the particular activity.

The effects of displacement of grizzly bears from key habitats are difficult to quantify and may be measurable only as long-term effects on the species' habitat and population levels (USDI-FWS 2005b). USDI-FWS 2005b wrote that incidental take will occur from the effects of high road densities persisting in some areas of FNF. However, grizzly bears are individualistic and display a wide variation in their tolerance of and response to human activity and road density (USDI-FWS 2005b). This Incidental Take Statement was extended in 2014, with acknowledgment that "displacement, and to a much lesser extent, habituation of grizzly bears will occur over a longer period of time than previously anticipated in some subunits" (USDI-FWS 2014b). However, the Service " determined that the best information available indicates that the NCDE grizzly bear population can sustain this level of adverse impacts from roads over the extended time frames, as proposed" (USDI-FWS 2014b).

Access - Numerous studies have documented that excessive open road densities in grizzly bear habitat during the non-denning season lowers their survival rate (Boulanger and Stenhouse 2014, Mattson, Knight, and Blanchard 1987, McLellan & Shackleton 1988, Waller & Mace 1997, McLellan and Shackleton 1989). Avoidance of habitats adjacent to roads and the negative impacts of high road densities and traffic volumes have been documented for grizzly bears. The risk of mortality increases significantly near motorized routes and include mistaken identification shootings for black bears or other game animals, poaching, malicious killing, and self-defense of life. Sometimes bears are struck by vehicles while crossing roads or foraging on roadkill. Others must be destroyed after becoming habituated to human food and garbage and livestock or pet feed that is often associated with motorized routes and developments. Some bears are displaced from large portions of their available habitat when they attempt to avoid motorized use areas and their associated human presence. Avoidance behavior is often strongest in adult grizzly bears, with males selecting for high quality habitats and absence of humans (Gibeau et al. 2002). Males that were found using high quality habitat near roads did so during the night where hiding cover was available (ibid). However, adult females were more likely to avoid humans rather than seek out the highest quality habitats. Mueller et al. (2004) reported all age and sex classes used habitats closer to high-use roads and development during the human inactive period. All bears showed a considerably greater avoidance of high-use roads and development during periods of high human activity.

Displacement is used in general terms to describe “under-use” of habitat. In research, “significant under-use” of habitat means that bears use habitat “less than expected” compared to its availability. The term “displaced” does not necessarily mean that grizzly bears would totally avoid an area, or be excluded in some way from ever using an area. Disturbance from roads or from alteration of habitat (high road densities) will likely cause female bears to significantly under-use important habitat (Mace and Waller 1998, USDI-FWS 2005b and 2014b). Such under-use of habitat likely leads to some level of impairment of normal breeding and feeding behavior in females. Significant levels of displacement from key habitats could result in a female bear’s failure to obtain adequate food resources, which in turn could result in reduced fitness and either failure to breed or mortality of cubs prior to or after parturition.

Waller and Servheen (1999) reported five of nine grizzly bears radio-collared in the Highway 2 corridor between Glacier National Park and the FNF maintained home ranges that were centered over the highway corridor, and remained in the highway corridor during their active season. However, they found that grizzly bears strongly avoided areas within 500 meters of the highway. The grizzly bear study in the Swan Mountains of Montana (Waller and Mace 1997, Mace et al. 1999) demonstrated relationships between roads and grizzly bear habitat use patterns. Bears tended to avoid roads, especially those open to motorized traffic. Bears are most vulnerable to human conflicts in areas with many roads and limited cover and escape habitat (Claar et al. 1999).

Long-term displacement of a female from a portion of her home range may result in the long-term under-use of that area by female grizzly bears because cubs have limited potential to learn to use the areas. In this way, learned avoidance behavior could persist for several years before grizzly bears again utilize habitat associated with closed roads.

With A-19, substantive changes in Forest access management were designed to minimize the negative impacts from roads and road activity to grizzly bears. FNF road management activities may displace grizzly bears, specifically female bears, from essential habitat and lead towards incidental take of grizzly bears. It is expected that displacement and under-use of habitat by grizzly bears would be reduced near roads with no motorized use or those that are decommissioned. The USDI-FWS (2004b, 2014b) defines incidental take of grizzly bears in terms of adverse habitat modification or loss caused by high road densities. The FWS maintains that the failure to achieve the A-19 standards for Open Motorized Access Density, Total Motorized Access Density, and Security Core within the bear subunits result in incidental take of grizzly bears and is likely to result in displacement of grizzly bears that leads to some level of significant impairment of grizzly bear breeding, feeding or sheltering. Such displacement is most likely to impair the normal reproductive potential of a few female grizzly bears, rather than lead to the mortality of a grizzly bear (USDI-FWS 2004b, 2005b). The FWS added that “the Service has determined that the best information available indicates that the NCDE grizzly bear population can sustain this level of adverse impacts from roads over the extended time frames, as proposed” (USDI-FWS 2014b).

Although open roads are still a high threat to grizzly bears for a number of reasons, the FNF has reduced its road density and increased security in many of its bear management subunits. Additionally, in 1985 the Forest Plan's desired future conditions for roads showed, "approximately 508 miles may be added to the road system with miles of major reconstruction being 170. The new roads are primarily local logging roads that will be permanently or seasonally closed." Because projections predicted "timber regeneration harvests will have taken place on 66,000 acres at an average annual level of 100 million board feet (mbf)." It is obvious that these impacts did not occur as the FNF has not sold 100 mbf in a year since 1983 and, except for one fire salvage year, timber sold has been below 50 mbf since 1993. New roads built on FNF between 1985 and 1995 totaled 140 miles while new construction from 1996 to 2010 has totaled just 24 miles (3.2 of which within NCDE). From a high of 4121 miles of system roads in 1989 the number has dropped to 3267 miles by Jan. 2010, a decrease of 854 miles. Another 55 miles of road were decommissioned during 2010 but 57 miles of former Plum Creek roads changed were added to the FNF database. Over 49 miles were decommissioned from 2011 to 2015 (USDA-FS 2016a).

Improper Food or Garbage Storage – If habituation to human foods or garbage and to livestock or pet feed occurs, a bear is often destroyed to resolve the conflict. Habituation is often associated with human facilities or along motorized routes. Within the Recovery Zone and across the rest of the FNF, there are restrictions on most public lands in the NCDE on storing and possessing human, pet and livestock food, garbage, and other attractants in a bear-resistant manner. Federal and state agencies, along with many conservation organizations, have numerous management, informational, and educational activities in place to reduce the chances of bears getting into food or garbage. Some deed restrictions for attractants are in place on Swan Valley private lands as a result corporate land sales.

Snowmobiling - Mace and Waller (1997) identified snowmobiling as a potential threat to denning grizzly bears but did not observe any den abandonment. The USDI-FWS (2006) noted there have been no reports of any grizzly bear mortality associated with snowmobiling recorded in Montana. Snowmobiling in open areas and on gated, bermed, or decommissioned roads after den emergence could disturb and/or displace bears. Snowmobiles are now allowed on potential grizzly bear denning habitat during the non-denning period on about 1.6% of the FNF area. There are about 6,700 acres of potential grizzly bear denning habitat within the extended-season snowmobile use areas that would be exposed to prolonged effects from snowmobiles. Adverse effects are possible to some individual bears due to temporal and spatial overlap between grizzly bears and snowmobiles in the four late spring use areas after the denning period ends March 31st. However, the proportion of habitat where the adverse effects are anticipated is a fraction (6,700 acres) of the available and well distributed denning habitat at the forest-wide scale which is estimated at 420,000 acres (USDA-FS 2004). About 52,000 acres of the FNF within the NCDE are available for snowmobiling during the first 4-8 weeks of the non-denning period (April 1-November 30). As pointed out by Mace and Waller (1997), dens were typically on steep slopes that are nearly impossible to traverse by snowmobile. The USDI-FWS (2006) concluded the effects to denning bears would be improbable and discernable but more concern should be placed on emerging bears especially females with cubs that linger in the den vicinity. The annual Amendment 19 monitoring report tracks late-spring over-snow vehicle use (USDA-FS 2016a).

Recreation – Risks of grizzly bear displacement, illegal killing, human self-defense actions and encounters with human attractants are possible with both motorized and non-motorized recreation, and trail-off-trail use. Mace and Waller (1997) and Graves (2002) found bears using areas near trails less than expected. The distances for Mace and Waller were between 200-500 meters for non-motorized trails and Graves' distance was at least 150 meters for motorized and non-motorized trails. Graves (2002) found that bears use areas near both kinds of trails (ATV and single-track) less than expected, even with relatively low levels of recreation. However, she points out with so much variance in the distances at which bear use of areas near trails becomes less than expected, it is difficult to assess the biological significance of the effects of recreational use on trails. A further complication in interpreting Graves (2002) results is that bears do not completely avoid trails. Bears sometimes will walk along trails, so interpretation should include assessment of how much less likely it is for bears to use areas around trails. Bears may respond to many characteristics of habitat besides the presence of humans on trails. Other factors such as location of bear foods, visual cover, water sources, social interaction with other bears, and recreational use off trails could be causing the distribution patterns of the bears. Management of the wilderness requires FNF to utilize guard stations and cabins that increasingly need bear-proofing maintenance due to the storage of food and stock feed.

Numerous studies in the NCDE elucidate the importance of late-season frugivory, especially globe huckleberries (*Vaccinium globulare*), by grizzly bears (Martinka and Kendall 1986). A poor berry crop (i.e. due to drought, fire, or frost) would force grizzly bears to range more widely than in normal periods of seasonal availability (Blanchard and Knight 1991). Therefore, grizzly bears face an increased risk of encounters with humans and ultimately human-caused mortality during the autumn season. Grizzly bears in some areas that avoided trails with human activity during part of the year changed this avoidance behavior when a favored berry resource came into season (Donelon 2004). Although grizzly bears still had a low tolerance for trails with high human activity, the tendency to approach areas of human activity when nutritional and energy needs are high could put individual bears at an increased risk of immediate conflict or condition them to the presence of people, which could lead to conflicts later in time.

Vegetation Management and Fire - Timber management and fire can 1) eliminate cover for resting, security and thermal regulation, 2) cause short-term changes in food availability, 3) displace bears from habitat during the fire management or logging period, 4) and increase human/grizzly bear confrontation potential or disturbance factors (USFWS 1993, Mace and Waller 1997, Witmer et al. 1998, and Ciarniello 2006). Without proper design criteria or mitigation, the value of early or diverse vegetative conditions is offset by the increased mortality risk with the loss of secure habitat (Nielsen, et. al 2008). Wildfires and timber management can be a mixed blessing as there can be a loss of food sources and cover for at least 15 years (Waller 1992), but they also create vegetative diversity conditions and early-seral food sources that typically characterize grizzly bear habitat.

Additionally, since the early 1980s through 2008, FNF records show over 33,000 acres directly improved for wildlife through prescribed burning, planting of shrubs and whitebark pine, slashing, weed treatments, and rehabilitation. Most of these acres have benefits for multiple species including grizzly bears. Prescribed fire is being used more for wildlife habitat improvement projects and is being used in many forest locations to reduce fuel concentrations. Considered together, the total of prescribed fire and wildland fire use represent the total acres where fire is defined as having a beneficial effects. The recent average of these two programs combined is about 9,800 acres. Much of this increase is due to the favorable conditions for fire use over the period; drought conditions leading to dry fuels, combined with numerous lightning fire starts in the Bob Marshall Wilderness Area, under conditions where fires can be safely managed for resource benefits. Thousands of acres of wildfire have occurred since 2000. The five year average for acres burned from 2003 to 2007 was 64,500 acres. Considered together, the prescribed fire and wildland fire use programs, and unwanted wildland fire averaged about 75,500 acres from 2003 to 2007. This represents fire disturbance on an average of 3% of the FNF on an annual basis.

With the application of best management standards to minimize and avoid impacts to grizzly bears, known research on use of harvested stands (Waller 1992), and the temporary and short-term nature of vegetation management, some increased mortality risks due to short term displacement during the human activity and avoidance afterwards is expected to occur until the forage and cover returns, and access is curtailed.

Blister Rust – Death of whitebark pine from blister rust is a threat to another rich food source, whitebark pine seeds. In a study of hazards affecting grizzly bear survival in the Greater Yellowstone Ecosystem (GYE), Schwartz (2010) found that bears shifted to lower-elevation habitats during years of poor whitebark pine seed production. Bears that shifted to lower elevations that had been altered by permanent human disturbance (more open roads, permanent developments, and homes) were subject to a higher level of mortality risk. Grizzly bears in the NCDE may not feed upon whitebark pine seeds to the extent they do in the GYE because whitebark pine is a much lesser component on NCDE landscapes and many trees have been dead for decades. The effects of this loss is unknown in the NCDE, as bear numbers appear to be increasing and bears do utilize a variety of food sources and habitats in their large and diverse home ranges.

Trains – Waller (2005) documented 1 to 2 trains per hour along the Burlington Northern Santa Fe (BNSF) railroad corridor between Glacier National Park and the FNF. Bears are known to die from collision with trains while crossing the tracks, in search of fresh vegetation along the right-of-way, and when grain is spilled during a derailment. BNSF has done a lot to minimize accidental deaths or habituation by placing scare devices along trestles and having a quick response derailment cleanup plan. BNSF and the USDI-FWS are in the process of developing a Habitat Conservation Plan for the railroad’s operations in grizzly bear country. 24-hour day and night train use will continue to be a source of human-caused mortality.

Other - Based on past growth and growth projections for northwestern Montana, human settlement and subdivision development in low elevation areas has, and will continue to have, a cumulative impact on grizzly bears through loss of habitat, displacement of individual grizzly bears, and mortality risk. These low elevation lands often encompass high quality riparian areas and other seasonal habitat preferred by grizzly bears. Such habitat attracts grizzly bears to private lands and puts bears into close proximity to people. Grizzly bears are lured to garbage, livestock and pet foods, bird feeders and other attractants. Grizzly bear mortality is associated with private lands or exposure to hazards on private lands. As human population centers expand there will be an accompanied increase in use of NFS lands for dispersed activities and developed facilities, and risks as a result of human/grizzly bear encounters may increase. Increased pressure for outfitting and guiding activities, special uses, cabin rentals, camping, interests in making ski resorts year-long recreation destinations, and other summer recreation pursuits may occur as well as a demand for better roads. On public lands outside of national parks, grizzly bear mortality also occurs during the black bear hunt season due to mistaken identity; during deer and elk hunting seasons in self-defense over a game carcass; and from malicious actions.

Conservation

Forest management proposed actions are evaluated using Section 7 consultation of the Endangered Species Act. The District Court of Montana (USDC March 31, 2008, page 52) concluded, projects that promote the recovery of the grizzly, such as reducing road density, increasing core habitat, and curbing the existing degree of under-use of habitat in the affected A-19 subunits, will meet the intent of the IGBC guidelines that favor the bear when land uses management decisions compete in Management Situation 1 areas.

Successful recovery of grizzly bears is largely dependent on human tolerance of the species and its needs. One of the most contentious issues facing grizzly bear recovery managers is public understanding and acceptance of motorized access management to minimize habitat displacement and reduce mortality risk. Successful human-bear conflict management also requires a multifaceted and multiagency approach aimed primarily at reducing or eliminating conflict situations rather than simply responding to it. The 2006 management plan for Western Montana (MFWP 2006) lists strategies to minimize or resolve human-grizzly conflict which include: 1) Inform and educate the public; 2) Develop and enforce practical and effective attractant storage rules/regulation; 3) Use of deterrents and/or aversive conditioning methods; 4) Necessary access management; and 5) Management control of nuisance bears. All these are actions the FNF conducts or cooperates in.

Conservation actions important for the grizzly bear include (1) habitat management to ensure grizzly bears have large expanses of suitable interconnected lands in which to exist, (2) management of grizzly/human interactions (food storage, relocations, and livestock) and (3) research to determine the population size and trends to ensure that grizzly bear populations are not being jeopardized (MFWP 2005).

1) Habitat Management

According to Costello, eta al (2016), a variety of "habitat management measures, especially those centered on National Forest lands, have also served to protect vital habitat and reduce human access and conflict, contributing to the productivity of bear populations and the reduction in human-caused mortality of bears." Extensive roadless and wilderness habitat reduces the risks of mortality due to vehicle collisions and other types of human-related mortalities, and reduces the potential negative effects of fragmenting small populations. These attributes are present on the FNF with approximately 69% in wilderness, proposed wilderness, or inventoried roadless

Access management on FNF began in the late 1970s, primarily for big game management and to protect roads when wet, but was also recognized as helping reduce bear mortality risks. Progress has been substantial when considering road miles restricted or decommissioned since A-19 was signed in 1995, at which time the FNF had an open road density of about 0.5 miles per mi². A-19 applies to 54 bear subunits totaling approximately 1,582,108 acres, located primarily outside the wilderness. These acres include corporate and state lands but exclude small lakes and other private lands. Between 1995 and 2010, about 682 miles of system road were decommissioned; the miles of road open with no restrictions decreased by 348 miles; and only 24 miles of new road (3.2 of which within NCDE) was constructed. Additional seasonal and yearlong restrictions to existing system roads have also occurred during this time period. By 2008 the open road density had decreased to about 0.4 miles per mi² (approx. 1458 miles/3688 mi² and to 1410 miles by 2010). Since 1995 security core habitat acreage has increased by over 281 miles² (Table 8a above). For subunits with more than 75% NFS lands, a summary of access density and core habitat conditions by subunit as of June 2011 is displayed in Table 8c (USDA-FS 2009). Open Motorized Access Density – 37 of 47 subunits >75% NFS lands meet A-19 or amended OMAD. Total Motorized Access Density – 31 of 47 subunits > 75% NFS lands meet A-19 or amended TMAD. Security CORE - 25 of 47 subunits > 75% NFS lands meet or A-19 or amended CORE.

Table 8c. Forest-wide summary of grizzly bear subunits with >75% Forest Service land, as of December 2015. Provides levels of open road density, total road density, and core habitat summary of Amendment 19 objectives (USDA-FS 2016a).

#	BMU Subunit	Ranger District	OPEN Route Density	TOTAL Route Density	Security CORE	A-19 Compliance Objective
1	Frozen Lake	GV	10	4	80	Meets
2	Ketchikan	GV	14	3	73	Meets
3	Upper Trail	GV	14	4	88	Meets
4	Lower Whale (amended 37-19-47)	GV	**36**	17	**50**	Meets
5	Upper Whale Shorty	GV	12	11	86	Meets
6	Red Meadow Moose	GV	25	17	68	Meets
7	Hay Creek	GV	25	16	55	
8	Coal and South Coal	GV	15	19	73	Meets
10	Werner Creek (amended 29-19-63)	GV	**29**	20	**63**	Meets
11	Lower Big Creek	GV	18	19	71	Meets
12	Canyon McGinnis (amended 19-33-53)	GV/TL	19	**32**	**50**	
17	Peters Ridge	HH/SL	52	25	34	
19	Swan Lake	SL	39	26	45	
22	Lion Creek	SL	18	47	41	
23	Meadow Smith	SL	20	53	42	
24	Buck Holland	SL	24	41	40	
25	Crane Mountain	SL	31	58	25	
27	Piper Creek	SL	19	45	55	
28	Cold Jim	SL	18	57	43	
29	Hemlock Elk	SL	6	30	64	
30	Glacier Loon	SL	22	41	48	
31	Beaver Creek	SL	6	26	66	
32	Doris Lost Johnny (amended 57-19-36)	HH	**57**	19	**36**	Meets
33	Wounded Buck Clayton (amended 27-30-65)	HH	**27**	**30**	**65**	Meets
35	Emery Firefighter	HH	19	20	58	
36	Riverside Paint	HH	18	16	71	Meets
37	Jewel Basin Graves	HH	19	19	68	Meets
38	Wheeler Quintonkon (amended 25-19-68)	HH/SB	**25**	19	68	Meets
39	Logan Dry Park	HH/SB	30	36	51	
40	Lower Twin	SB	9	2	92	Meets

#	BMU Subunit	Ranger District	OPEN Route Density	TOTAL Route Density	Security CORE	A-19 Compliance Objective
41	Twin Creek	SB	0	0	100	Meets
42	Moccasin Crystal	HH	8	1	81	Meets
43	Stanton Paola	HH	8	3	81	Meets
44	Dickey Java	HH	9	0	81	Meets
45	Long Dirtyface	HH	0	0	100	Meets
46	Tranquil Geifer	HH	0	2	85	Meets
47	Skyland Challenge	HH	20	17	65	
48	Plume Mtn Lodgepole	HH/SB	0	0	97	Meets
49	Flotilla Capitol	HH/SB	0	0	99	Meets
50	Ball Branch	SB	7	12	84	Meets
51	Kah Soldier	SB	19	19	68	Meets
52	Spotted Bear Mtn	SB	19	18	68	Meets
53	Big Bill Shelf	SB	11	6	80	Meets
54	Jungle Addition	SB	19	19	68	Meets
55	Bunker Creek	SB	5	3	92	Meets
56	Gorge Creek	SB	0	0	90	Meets
57	Harrison Mid	SB	1	0	95	Meets

Subunits meet LMRP A19 objective.
Subunits meet amended LMRP A19 objective.

Seven subunits have Forest Service ownership on less than 75%, and all of them meet the "Forest Service activities will not result in an increase in motorized access density or reduction in security core areas on NFS lands" objective on NFS lands (Table 8d; USDA-FS 2016a), and most subunits have improved in habitat conditions since 1995.

Table 8d. Forest-wide summary of grizzly bear subunits with <75% Forest Service land, as of December 2015. Provides levels of open road density, total road density, and core habitat summary of Amendment 19 objectives (USDA-FS 2016a).

#	BMU Subunit	Ranger District	OPEN Route Density	TOTAL Route Density	Security CORE	A-19 Objective Compliance
9	State Coal Cyclone	GV	29	25	58	Meets
13	Cedar Teakettle	GV	25	27	24	Meets
18	Noisy Red Owl	SL	20	16	52	Meets
20	South Fork Lost Soup	SL	25	47	37	Meets
21	Goat Creek	SL	23	59	39	Meets
26	Porcupine Woodward	SL	27	73	15	Meets
34	Coram Lake Five	HH	26	46	14	Meets

Subunits meet LMRP A19 objective.

A-19 included both five and ten-year objectives for reaching the standards. These were not met due to a combination of reasons including reduced budgets, increased wildfire recovery and salvage activities, reduced road access management funding, and management concerns due to increased local resistance. The A-19 Decision Notice recognized that meeting the applicable open road density, total road density, and core habitat objectives in all subunits may not be possible as some site specific applications may reveal unanticipated or impractical results in some subunits (such as social or safety needs). A result would be those subunit objectives may need to be changed through individual subunit consultations. This programmatic consultation, and another for access and activities outside the recovery area, has provided Incidental Take Statements that cover a certain amount of motorized access effects in future projects. As long as FNF remains within the standards or sideboards of activities our actions are not expected to jeopardize the recovery of the grizzly bear. The FNF habitat now supports a recovered grizzly bear population, even though 19% OMRD, 19% TMRD, and 68% core levels have not been achieved in every subunit (USDA-FS 2016b). In their Biological Opinion on Effects of the FNF Plan Amendment 19 Revised Implementation Schedule (USFWS, 2014b), the FWS concluded "In summary, the existing access management conditions are good to very good for grizzly bears in the NCDE, with a few site specific exceptions. It is our opinion that motorized access is managed across the NCDE at levels that are evidently conducive to grizzly bear population growth and conserve grizzly bear habitat".

The Swan River State Forest has been a party to the Swan Valley Grizzly Bear Conservation Agreement (USDI-FWS 1997) along with Plum Creek Timber Company, the FNF, and USFWS since 1995. This agreement has coordinated timber harvest activities and associated road management across the multiple land ownerships in the Swan Valley in a manner that has contributed to the recovery of the grizzly bear population. Under this agreement, three years of rest (during which low-intensity, administrative activities may occur, but public access is restricted) must be provided after three years of management activities; areas with open road density >1 mi/mi^2 must not exceed 33 percent of each bear management subunit; road closure devices are maintained; and seasonal road closures are implemented (USDA-FS 2016b).

Since 1995, over 51,100 acres of FNF acquisition and 7,200 acres of land easements on corporate lands have occurred, primarily in the Swan Valley, with an objective to reduce the risk to grizzly bears from additional private land development and maintain natural landscape linkages. During the 1980s, several hundred acres along the North Fork and Middle Fork of the Flathead River were placed under development easements associated with the Wild, Scenic and Recreational River Corridor. Both of these efforts have reduced the amount of acres that could have been sold or subdivided for additional home sites and associated development activities. Acquisition or easements assures these lands are maintained in habitat now and for the future and reduces the mortality risks due to habitat fragmentation and human conflicts.

Recently, a land transfer known as the Legacy Project was completed in the Swan Valley. The Nature Conservancy and The Trust for Public Land agreed to purchase lands from Plum Creek Timber Company and then sell or donate these lands to Federal, State, and private owners. The vast majority of these lands became USFS or Montana Department of Natural Resources and Conservation owned, and any lands that were sold to private owners have safeguards (e.g., conservation agreements) attached to them so that the integrity of wildlife habitat is maintained. The "fiber agreement" that was part of the Legacy Project and necessitated coordination of timber harvest on Legacy lands has now ended. In the foreseeable future, Montana Department of Natural Resources and Conservation may be managing their lands in the Swan Valley using their Habitat Conservation Plan, rather than the conservation agreement (USDA-FS 2016b).

For additional information, see the "Habitat" section above under grizzly bear "Population, habitat, and Distribution".

2) Grizzly/Human Interactions Management

Mace and Waller (1997) suggest that grizzly bears can persist in areas with roads, but spatial avoidance will increase and survival will decrease with higher road densities, traffic levels, and human settlements. Bears need to use and survive in lower elevation mixed-ownership lands. Mace and Waller (1997) go on to write, habitat improvement through road decommissioning will not be enough if habituation and mortality levels are not minimized on or adjacent to private lands.

Montana Fish, Wildlife, and Parks (MTFWP) manages grizzly bears according to the grizzly bear management plan (2006), stating "Montana Fish, Wildlife and Parks will manage grizzly bears in western Montana where they occur throughout the region, but at the same time respond to and manage conflicts." The FNF has cooperated with many other agencies to help fund one of the MFWP Grizzly Bear Management Specialists. The position works on both public and private lands to correct problem situations and educate people about how to live with bears and minimize the potential for conflicts. The Management Specialist has pioneered efforts in rapid and complete cleanup of railroad grain spills, the use of aversive conditioning techniques to educate bears including the use of Karelian bear dogs, and the hazard and necessity of the cleanup of large and small attractants at private residences. The work has probably led to an increased ability of grizzly bears to utilize habitats in areas currently having high mortality risk and low use potential. The FNF Grizzly Bear Relocation Plan identifies numerous sites that may be used to relocate grizzlies identified as nuisance bears under IGBC and FNF guidelines. Typically, several grizzlies that become problem bears off FNF are relocated to the FNF each year. In addition, grizzlies may be captured and moved short distances or released on site with aversive conditioning before they become a habituated or food-conditioned bear.

Minimizing the risk of mortality due to conflict with humans and human associated foods is also an important facet of grizzly bear management. A food storage special order was signed on April 15, 1998, applying to National Forest System lands within the NCDE on the Flathead, Lewis and Clark, Lolo, and Helena National Forests. In June 2011, a food storage special order was put into place to include the rest of the FNF. The purpose of the restrictions is to minimize grizzly bear/human conflicts and thereby provide for visitor safety and recovery of the grizzly bear. The food storage orders contain forest user requirements for storage and handling of bear attractants such as human foods and garbage, livestock feed, and wildlife and livestock carcasses (http://www.fs.usda.gov/flathead). Permit holders and contractors operating within the NCDE are subject to the food storage orders. In areas outside of the recovery zone, the food storage order is also included in many kinds of permits and contracts. All permits and contracts have provisions or restrictions for threatened and endangered species. Since the early 1990s, metal food storage boxes and food hanging poles have been installed at several campgrounds and campsites. Bear-resistant dumpsters and garbage cans have been installed at various locations on FNF. In addition to these physical improvements, some back-country cabins have been re-enforced to make them more bear resistant. The Forest Service offers a loaner program for bear resistant food containers and panniers. Monitoring has been in the form of periodic visitor contacts made primarily by FNF seasonal personnel during the summer. The FNF also helps to cooperatively fund "bear rangers" on all ranger districts to provide information, education and compliance with food/garbage storage. At times FNF has provided patrols and monitoring for food/garbage safe storage. We conduct hunting season patrols by Law Enforcement and Wildlife personnel for access and food storage violations.

To minimize the risk of human-grizzly conflicts from recreational activities, the FNF has a very active Information and Education bear awareness program that incorporates public presentations; visitor centers staff, pamphlets, roadside postings, trailhead and campsite information boards and kiosks, and the FNF website. Partnerships with Whitefish Mountain Resort and Swan Valley Connections aid greatly in getting a bear awareness message out to forest visitors. The FNF is a partner in the Great Northern Ecosystem Stewardship Area (GNESA) which has a goal of reducing human and grizzly bear conflicts and preventable bear deaths. The FNF developed a “Why Some Roads Are Closed” brochure. We have this and other bear information and safety brochures available at our offices. We provide programs on bear identification and safety that are presented to schools and the public upon request. Annual programs on bear identification, safety, and bear pepper spray use are presented to Forest employees.

FNF has completed a Winter Motorized Recreation Plan (Forest Plan Amendment A-24) which reduces the potential impacts from where snowmobile activities might have been occurring. A monitoring plan includes the use of information boards, on-the-ground snow rangers and aerial observing of snowmobiles for use in unauthorized locations and possible conflicts with emerging grizzly bears, especially in the four late-season sledding areas.

To lessen mortality risks off forest, the State and County governments have been cleaning up community dumpster sites to make them more secure from bear disturbance. Highway 93 reconstruction provided for animal underpasses and other highway projects will consider underpasses to lessen the risk of vehicular collisions. Bear managers and researchers are refining their techniques to minimize the risks of accidental death from handling by using cameras and DNA analysis to avoid capturing non-target bears. In order to hunt black bear all hunters must take and pass a bear identification test prior to purchasing a black bear tag.

3) Population size and trend research

The FNF was an active participant in two grizzly bear population monitoring studies using DNA sampling techniques. The first was carried out in the Greater Glacier (1998-2000) study located in approximately the northern one-third of the NCDE. The second study was the Northern Continental Divide (2004) which was designed to derive a grizzly bear population estimate for the entire NCDE. Both efforts were conducted in cooperation with Glacier National Park, U.S. Geological Survey, Blackfoot Tribe, Kootenai and Lewis and Clark, and Helena National Forests, Montana Fish, Wildlife, and Parks, Montana Department of Natural Resources and Conservation and other organizations. Grizzly bear population estimates from these efforts are provide above in the “Population” section under “Population, Habitat, and Distribution”.

As a continuation of their research, MFWP is conducting an interagency population monitoring study for grizzly bears in the NCDE. There are multiple partners, including the FNF, in establishing an estimated population trend for the NCDE. Data on mortality, survival and reproduction is collected annually. Based on the number of females with cubs being monitored and estimates of cohort survival, a reliable trend estimate was produced and published for the NCDE. The best available information suggests the grizzly bear population on the FNF and in the NCDE is expanding outside the recovery zone and has a population exceeding recovery plan levels (Mace et al 2011, Mace & Roberts 2012).

Grizzly bear mortality appears to have peaked in the 1970s according to records shown by Servheen (unpublished reports to IGBC and NCDE committees). Mortality declined to a low in the early 1990s but has increased since then. Recent high levels of human-caused grizzly bear mortalities in the NCDE have raised a concern. However as mentioned earlier, the best current information suggests that the grizzly bear population on the FNF and NCDE is expanding its range beyond the recovery zone and has a population above recovery plan level estimates. With more bears and people on the landscape, human/bear encounters are expected to increase with mortal consequences to bears. Much of the recent grizzly bear mortality is primarily associated with conflicts arising from attractants on private lands rather than conflicts on public lands (USDI-FWS 2014b).

Based on the best available information, the FWS concluded that "the status of the NCDE grizzly bear population is generally robust and at or nearing recovery" (USDI-FWS 2013 and 2014b). The NCDE grizzly bear population "currently meets all the demographic recovery criteria, including number of BMUs occupied by family groups and sustainable human-caused mortality levels for both total and female grizzly bears" (USDI-FWS 2014b).

Evaluation of Current Situation on NFS Lands

Seven main Grizzly Bear Recovery Plan actions (RPA) needed for recovery. These are: 1) minimize sources of human-bear conflict, 2) limit habitat loss or degradation because of human actions such as road building, timber harvest, oil and gas exploration and development, mining, and recreation, 3) improve habitat and/or security where applicable, 4) understand the relationship between bear density and habitat value to better understand limiting factors, 5) develop techniques to successfully move bears into areas where the populations are in need of augmentation, 6) improve public relations and education to develop better support for and understanding of the species and to minimize adverse human actions, 7) continue grizzly bear and habitat research to ensure adequate scientific knowledge is available on which to base management decisions.

In summary, grizzly bear population conservation and habitat diversity is being provided for because:

- The species is found throughout FNF, parts of Montana, Idaho and Wyoming and north into Canada and Alaska.
- Kendall, et al. (2009) research indicated there are a minimum of 765 bears in the Northern Continental Divide Ecosystem. This is a substantial increase from previous estimates, including the recovery plan estimate, and the best available science indicates that the population was growing in terms of abundance, occupied habitat, and connectivity in areas of historically low genetic interchange. Their abundance estimate was more than double the existing estimate. This same study also concluded:
    1) Female grizzly bears were present in all 23 BMUs.
    2) Female grizzly bears number and distribution indicated good reproductive potential.
    3) The occupied range now extends 2.6 million acres beyond the 1993 recovery zone.

4) The genetic health of NCDE grizzly bears is good, with diversity approaching levels seen in undisturbed populations in Canada and Alaska.
5) NCDE population genetic structure suggests a population growth from 1976-2007.
6) Human development is just beginning to inhibit interbreeding between bears living north and south of the U.S. Highway 2 corridor, west of the Continental Divide.

- Mace, et al. (2012) shows after 6 years of monitoring for population trend, the trend is positive with an estimated lamba of 1.03 (increase of 0.3%).
- Costello, et al. (2016) estimated a positive population trend of 1.023 (increase of 2.3%) with the inclusion of management bears.
- Forest management actions with potential effects undergo USDI-FWS consultation (RPA #1, 2, and 3).
- Proposed FNF projects promote grizzly recovery such as reducing road density, increasing core habitat, and curbing the existing degree of under-use of habitat (RPA #1, 2, and 3).
- FNF management standards and management activities minimize conflicts with access, recreation, permits/contracts, timber, grazing, forest-wide food storage (RPA #1, 2, 3 and 6).
- The FNF maintains its undeveloped nature with about 69% managed as wilderness, porposed wilderness, or inventoried roadless (RPA #1 and 2).
- 282 mi² of security core have been added to FNF since 1995 (RPA #1 and 3).
- Information/education programs and visitors centers highlight bear awareness, plus FNF kiosks, bulletin boards, trail heads, and offices provide bear awareness education and information (RPA #1 and 6).
- The FNF participates in on-going multiagency cooperative cumulative effects modeling, research for population and trends, and bear relocations (RPA # 4, 5 and 7) and has helped fund a cooperative bear management specialist position (RPA #1 and 6).

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

16. Grizzly bear recovery plan monitoring: number of females with cubs, occupancy of BMUs by family groups, and known human-caused mortality.

16b. Grizzly Bear Habitat

17. Biological Evaluations (Assessments)

17a. Seasonal habitat values and habitat effectiveness index values, by BMU Subunit.

20b. Distribution of forest carnivores.

54. Open Road Density

Other factors outside of the Forest Service's control (i.e. malicious killing, railroad/auto mortality, ungulate availability, hunter misidentification) have negative effects on grizzlies. Based on the above analysis, management actions and on-going activities occurring on the FNF will continue to provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the grizzly bear. There appears to be little risk of population loss due to forest management activities and the species will remain present and well distributed across FNF. The FNF is expected to continue to maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole. Increasing visitor recreational use requires the forest to maintain diligence in managing human access and in proper storage of food, garbage, feed and other attractants; and to continue to cooperate in multi-agency conservation efforts and studies.

HARLEQUIN DUCK *(Histrionicus histrionicus)*

The harlequin duck is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, this duck is an indicator that the needs of other wildlife species that use swift mountain streams are met, particularly those associated with downed logs. It is uncommon throughout FNF, and found in the northern Rockies, and up into Canada and Alaska. Although not a common species, local populations appear stable based on monitoring. Along with several other factors, Forest Plan direction for riparian habitats would not lead to any loss of viability for this species.

Natural History

The harlequin duck is a small sea duck that travels inland to breed on freshwater streams. During the breeding season, female harlequin ducks and their young typically live on oxbows and ponds adjacent to mountain streams until the ducklings are old enough to feed and travel in fast stream currents. Nests are well hiden and located in woody debris in streams, overhangs in stream banks, or in adjacent tree cavities. In Northern Idaho, old growth and mature forest was adjacent to 90% of observation sites, and woody debris was present at 77% of sites (Cassirer and Groves 1989). Clear, low gradient, fast moving and clean mountain streams with an abundance of aquatic insects appear essential for successful reproduction (Cassirer, et al. 1993).

Population, Habitat, and Distribution

North American harlequin duck populations range from the northern Rocky Mountains north through Canada and Alaska to the coastal areas, and in extreme northeastern Canada coastal area (NatureServe 2006). The harlequin duck is an uncommon and localized breeder throughout the Rocky Mountains of the Forest Service Northern Region, wintering along the North Pacific Coast (Reel, et al. 1989). Banded birds from the Rocky Mountains are seen off the coast of Oregon, Washington, and British Columbia (Cassirer, et al. 1996). In Montana, the harlequin duck’s narrow and fragmented range is found primarily in northwestern Montana, including Glacier National Park which may be the best place to see harlequin ducks in the lower 48 states, and parts of the Greater Yellowstone ecotype (MFWP 2005).

Harlequins return to nest only in streams where they were born. They need clear, fast-moving streams with dense riparian cover, boulders for loafing, and high aquatic insect populations for feeding. Twenty-five percent of the known MT breeding population uses one stream in Glacier National Park (Bate 2013)(MT SWAP 2014).

Approximately 300 pairs of harlequin ducks are estimated to breed on 138 streams in the US Rocky Mountains (Cassirer, et al. 1996) with potential breeding habitat remaining to be located. At least

159 pairs nest in Montana (Reichel, et al. 1997) with breeding confirmed on approximately 32 streams (Reichel and Genter 1995). Thirty-three streams in northwest Montana with suitable habitat were surveyed from 1989-present, with harlequins present on at least18 and confirmed breeding on 10 streams (Bate 2013). Five of these streams are on the FNF. Harlequin ducks have been documented during the breeding season on a number of streams throughout the FNF, but breeding has not been confirmed on all of these streams (Carlson 1990). Trail Creek in the North Fork and Spotted Bear River in the South Fork were identified in the 1996 conservation assessment as streams to monitor annually for harlequin ducks. This has continued into the 2000s as surveys on the FNF have seen broods on Spotted Bear River in the South Fork and Trail Creek in the North Fork. Other sites with reported or observed breeding season use are (Cassirer, et al. 1996) are Red Meadow Creek, Whale Creek, and Big Creek up the North Fork; Granite Creek, Bear Creek, Ole Creek in the Middle Fork; and Bunker Creek, White River, Little Salmon Creek, Sullivan Creek and Wounded Buck Creek in the South Fork.

Harlequin ducks are difficult to monitor because the habitat is often in remote locations in grizzly bear country, and the surveys typically require long travel down steep, noisy, rocky streams lined with thick vegetation and layers of downed logs. Survey timing is critical but pair bonding surveys are in mid-spring and often during high water with ½ the population, the males, returning to the coast soon after mating (Cassirer, et al. 1996). Spring surveys may also displace breeding birds. Brood surveys are best conducted during a short 3-week period in late July – early August. In addition, the females and young sometimes remain hidden and thus avoid detection.

Across North America, the range of the harlequin duck has decreased dramatically from historic levels (Genter 1993). Local populations appear to be stable, although there is virtually no information from before 1988 [recent surveys and (Reichel per. comm. 1995)]. Low population size, restricted distribution, narrow habitat requirements, and small numbers of breeding ducks have led to the listing of this species as sensitive. However, additional locations of harlequins may turn up in Montana (NatureServe 2006). The Montana NHP state rank for the harlequin duck, a Species of Concern, is S2, "at risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state."

Threats

Loss and/or degradation of shoreline habitat, disturbance, water pollution and hunting on wintering areas are identified as threats (Genter 1993). Human activities of greatest concern for protection of harlequin ducks are disturbances within riparian areas during nesting season that cause nest abandonment, removal of streamside vegetation that provides visual screening, and degradation of water quality that would affect prey (aquatic insects) populations. Other threats mentioned are stream flow changes by mining, roads, and timber harvest; impoundments and diversions on breeding streams; destruction of food base via pesticides; shoreline development; and activities on wintering and breeding areas (NatureServe 2006). Mortality factors include over-harvesting of remnant populations, which may occur in the Pacific and may be continuing to occur in the Atlantic and oil and other contamination in coastal areas (NatureServe 2006). Hendricks and Reichel (1998) list several factors that limit productivity and recolonization: 1) high female natal site fidelity; 2) high adult site fidelity; 3) pair bonds developing on the wintering grounds; 4) low levels of movement on the breeding grounds; 5) relatively advanced age at first reproduction; 6) little chance of renesting after about 2 weeks following the start of incubation; 7) low and irregular levels of reproductive success; 8) patches of suitable habitat which are highly fragmented; 9) sensitivity to disturbance; 10) the clumped distribution of pairs, even in apparently homogeneous habitat; 10) declining range-wide and regional population levels; 11) relatively small and isolated regional populations; and 12) use of coastal wintering habitat immediately offshore (often less than 100 m).

Conservation

Conservation includes decreasing human disturbance such as boating, hiking, and camping during breeding season (MFWP 2005). Extensive roadless and wilderness habitat reduces the risks of disturbance due to human-related activities. These attributes are present on the FNF with approximately 69% in wilderness, proposed wilderness, or inventoried roadless. Under the FNF Forest Plan, riparian areas surrounding perennial streams are allocated to Management Area 12, and are protected under INFISH direction. The goal for MA-12 is to enhance vegetation and wildlife diversity, and to maintain or enhance water quality and fisheries. Protection of harlequin duck habitat is compatible with this direction. The FNF distributes posters asking the public and employees for information on harlequin duck sightings. Sediment delivery and disturbances is managed through river access sites which are managed for minimum impact to resources, riparian and stream zone protection measures, culvert removal and/or replacement to eliminate chronic sediment sources, and road decommissioning to minimize disturbance and sedimentation.

Federal laws manage migratory waterfowl harvest regulations and monitoring. Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states “Project decisions will not result in loss of species viability or create significant trends towards federal listing.”

Evaluation of Current Situation on NFS Lands

Summary for the harlequin duck and its habitat:

- Present in low numbers throughout FNF, the northern Rockies and Canada and Alaska.
- Although the range has decreased from historic levels, local populations appear stable.
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation.
- Is conserved through riparian forest management standards, fish and wildlife habitat improvement projects associated with roads and culverts.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.

26. Fish Habitat; Need for Fish Habitat Improvement
29. Fish Habitat; Water Temperature
45. Change in Water Quality
46. Water Yield Change from Timber Harvest
47. Sediment Yield
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.

Other factors outside of the Forest Service's control (mortality on the wintering grounds, disturbance by humans at unknown breeding sites, etc.) may have negative effects on harlequin ducks. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the harlequin duck. There appears to be little risk of population loss due to forest management activities and the species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

NORTHERN BOG LEMMING (*Synaptomys borealis*)

The northern bog lemming is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, this aquatic lemming is an indicator that the needs of other species that use small wetland habitats are met. There are only two known locations on the FNF, although potential habitat is well distributed across all ranger districts. Its habitat is protected by riparian management direction and there appears to be little risk of population loss and species viability will be maintained.

Natural History

The northern bog lemming is a sociable, short-tailed rodent found in wet meadows containing standing water and extensive coverage of sedges and species such as sphagnum moss. High value habitat components include fallen logs and other woody debris (Hickman et al. 1999). It is also occasionally found in "mossy forests, wet sub-alpine meadows, and alpine tundra" (Reichel and Beckstrom 1994). Northern bog lemmings have a small home range of less than 1 acre. On the FNF, potential habitat is identified as a specific subset of riparian landtypes NL1A or NL1E which includes sphagnum bogs with sphagnum moss, grasses and sedges.

Population, Habitat, and Distribution

The Montana state rank for the northern bog lemming is S2, which is "at risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state."

The northern bog lemming has a widespread distribution extending from Alaska east to Labrador and south to portions of the northern United States. The northern bog lemming has few populations in the lower 48 states due to the disjunct nature of the populations with the 1) the localized nature of its primary habitat; and 2) the currently patchy distribution of a boreal species that was more widely distributed during the Pleistocene period (Reichel and Beckstrom 1993). In the northwest it is known from very few locations [8 locations in Washington, 4 locations in Idaho, with 21 occurrences in Montana (Reichel and Beckstrom 1993, MFWP 2010)]. Following glacial retraction approximately 10,000 years ago, this species has become a glacial relict with localized primary habitat. In Montana, the northern bog lemming is at the southern margin of its global distribution in the Rocky Mountains. The 21 widely scattered locations in western Montana are primarily on USDA-FS–managed lands (MFWP 2005, MFWP 2010). This species appears to be absent from areas of potentially suitable habitat, but the reasons are not understood. Some relatively large areas do not have lemmings "because they were extirpated since the Pleistocene or never recolonized following the melting of the glaciers" (Reichel and Beckstrom 1993).

Two occurrences have been documented on the FNF. One was described by Reichel and Beckstrom (1993) within the Bowen Creek drainage on the Tally Lake Ranger District. At this time another population was found nearby in Sunday Creek on the Kootenai NF. Another was found on Swan Lake Ranger District in 2006 (2 bog lemmings caught along the edge of Meadow Lake, south of Bunyan Lake and west of Lindbergh Lake, in the Condon area). Montana NHP attempted to locate northern bog lemmings in eight locations in the Swan Valley, but no lemmings were caught despite 1,670 "trap nights" with snap traps (Reichel and Beckstrom 1993). Northern bog lemmings are very difficult to monitor and survey because they have natural population fluctuations, their habitat is difficult to travel across, and they occupy burrows up to 1 foot deep in riparian vegetation. Lethal snap traps appear to be approximately 10 times as effective for sampling than are live traps, which still cause more than 50% mortality (Reichel and Beckstrom 1993, 1994). Montana FWP is evaluating track-plate and other survey methods for this species (Chris Hammond, pers. comm. 2010).

This species' habitat appears to be very specific and limited to some of the areas mapped as riparian landtypes NL1A or NL1E. These landtypes are characterized by low gradient (nearly level, valley bottom, 2-4% slopes), with relatively fine substrates (clays, silts, fine and medium sand), and subalpine fir (NL1A) or willow and sedge (NL1E) potential vegetation community. These landtypes comprise a small fraction of the land base, but are distributed across all ranger districts (Table 3a above, for Boreal Toad). It appears sphagnum moss is a key indicator for potential habitat. Potential habitat exists on the FNF and with additional surveys more occupied habitat may be discovered on the FNF.

Threats

Possible threats to bog lemmings include livestock grazing, road construction, adjacent vegetation management, invasion by exotic plants, and potential changes in the water regimes feeding the wetlands. Apparently suitable but disjunct habitat with limited recolonization opportunity by a species with a small home range. However, special management requirements are in place for riparian management on national forest lands.

Conservation

Protection of known habitat would be the most critical factor that the Forest Service has control over. Existing regulatory protections of riparian and wetland habitats on the FNF are substantial, and somewhat redundant (multiple laws providing overlapping protection) provide conservation of the known habitat and potential habitat. No grazing occurs and no roads cross the wetlands where the two northern bog lemming sites are located.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states "Project decisions will not result in loss of species viability or create significant trends towards federal listing."

Various species will be emphasized for surveys in the next few years according to the 2005 MFWP Comprehensive Fish and Wildlife Conservation Strategy. Species with greatest inventory needs include the: Northern Bog Lemming (MFWP 2005).

Evaluation of Current Situation on NFS Lands

Summary for the northern bog lemming and its habitat:

- Is known at only two locations on the FNF and at least 22 sites across northwest Montana and is widely distributed up into Canada and Alaska.
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation.
- Is conserved through riparian forest management standards.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
45. Change in Water Quality
46. Water Yield Change from Timber Harvest
47. Sediment Yield
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.

Other factors outside of the Forest Service's control (i.e. global warming) may have negative effects on the northern bog lemming. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure, and processes according to the suitability and capability of NFS lands for the northern bog lemming. There appears to be little risk of population loss. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

NORTHERN GOSHAWK (*Accipiter gentilis*)

Based on the work of Kowalski (2006b) and Samson (2005), Forest Wildlife Biologists across Region 1 recommended the removal of the goshawk from the Sensitive Species List in 2007 and the northern goshawk is no longer a USFS Region 1 Sensitive Species. Nevertheless, it is a gauge for closed-canopy lower montane and montane forests. Amendment 21 of the FNF Forest Plan stated that effects of projects on goshawk habitat would continue to be assessed at the project level. In its status review, the FWS determined that listing under the Endangered Species Act was not warranted (USDI-FWS 1998). Based on the FNF goshawk surveys, Montana Natural Heritage Program (NHP) occupancy data, Samson (2005, amended 2006) and USDA-FS (2008b) it appears the FNF (see Table 9) and some other Forests do have naturally limited habitat, although suitable habitat for the goshawk is well distributed across the Northern Region of the Forest Service. This species is conserved through forest management standards associated with riparian habitat, old growth habitat, down woody material/snags, and the best available goshawk nest-site and post-fledgling conservation science.

Natural History

Goshawks use large landscapes, integrating a diversity of vegetation types to meet their life-cycle needs (Squires and Kennedy, 2006). Reynolds and others (1992) described the goshawk as a forest habitat generalist and prey specialist that uses all major forest types and a variety of forest ages, structural conditions, and successional stages. Goshawks generally nest in forested stands with large trees, high canopy closure, and relatively open understories. Habitat structure (high canopy closure, high tree density and high density of large, >16" dbh, trees) seems more important than prey availability. Nest areas include forests with a narrow range of structural conditions (Reynolds et al. 2008, Squires and Reynolds 1997). Goshawks generally select stands based on structure, but selection varies by forest type. For example, in lodgepole pine stands, canopy closure ranged from a mean of 34 to 80 percent and a tree size ranged from 9 to 15 inches d.b.h. Hayward and Escano (1989) found that nest sites in mixed species stands of northwest Montana were often located in stands that supported widely-spaced large trees. Squires and Kennedy (2006) found that nest areas are usually mature forests with medium to large trees, canopy closure of 60-90%, and an open understory. On the FNF, nests have also been found in more dense mixed species stands where there is a break in the topography or canopy. The average patch size of core nesting areas varies according to available habitat conditions, but averaged 40 acres in west central Montana. The post-fledging area (PFA) of 200-500 acres is defined as the area used by the family group from the time the young fledge until they are no longer dependent on the adults for food (Reynolds et al. 1992). Goshawk foraging areas are diverse and may include mature forest as well as a mix of other forest and non-forest components. For more information on the ecology, behavior, and habitat of the northern goshawk, see "A Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region, USDA Forest Service" (Samson 2005, updated 2006).

The Fish and Wildlife Service found no evidence in its finding that the goshawk is dependent on large, unbroken tracts of "old growth" or mature forest (USDI-FWS 1998). Conversely, as cited in Brewer (2006), Greenwald et al. (2005) prepared a literature review of a few selected studies concluding that goshawks select mature to old-growth forests in their home range and criticizing the management recommendations of Reynolds et al. 1992. Unlike Reynolds et al. (1992), Greenwald et al. (2005) suggest that goshawks are prey generalists and habitat specialists. However, Reynolds et al. 2005 rebutted Greenwald et al. 2005 by providing a more comprehensive review of the literature, which supports the Service's review, finding that Greenwald's criticisms were based on misunderstandings of the desired goshawk habitats described in Reynolds et al. (1992), an under-appreciation of the extent of variation in vegetation structure among forest types and seral stages used by goshawks, a limited understanding of the ecological factors limiting goshawks, a failure to understand the dynamic nature of forest habitats, and incomplete reviews of the literature. Another study by Beier et al. (2008) questions Reynolds interpretations. Beier et al. (2008), based on a small sample and use of observational rather than experimental approach, found a moderate negative correlation between goshawk productivity and the forest structure prescribed by the guidelines, which led them to question the benefits to goshawks. Factors other than forest stand conditions may influence goshawk breeding more than desired stand conditions – weather, prey abundance, individual pair success, and human disturbances. In fact quite a few studies have concluded weather does play a role in goshawk productivity (Fairhurst and Bechard 2005; and Moser and Garton 2009; and others). Cold Januarys and wet Aprils led to less successful nesting in Idaho (Moser and Garton 2009) and cold temperatures in February and March with increased April precipitation led to declines in occupancy of nesting territories in Nevada (Fairhurst and Bechard 2005). Variations in climatic factors such as cold temperatures and high snowpack and rain in spring may play a major role in determining the number of goshawk pairs that breed annually.

<u>Population, Habitat, and Distribution</u>

The northern goshawk is a forest raptor, occupying boreal and temperate forests throughout North America and around the globe (USDI-FWS 1998). In an assessment of the Upper Columbia River Basin, the northern goshawk was expected to have a "favorable" outcome under current management direction (Quigley et al. 1996). USDI-FWS (1998) found that while forest management (e.g., timber harvest and fire exclusion) has changed the vegetation characteristics throughout much of the western United States, the goshawk continues to be well-distributed throughout its historic range. They found no evidence that the goshawk population is declining in the western United States, that habitat is limiting the overall population, that there are any significant areas of extirpation, or that a significant curtailment of the species' habitat or range is occurring. In its 1998 status review, the USDI-FWS determined that listing under the Endangered Species Act was not warranted (USDI-FWS 1998). Kennedy (1997) conducted a review of available, peer-reviewed research, and found no evidence of a decline in goshawks in North America based on its range, demographics (density, fecundity, and survival), and population trends. Squires and Kennedy (2006) concluded there is no evidence that the North American goshawk Population is declining. Existing demographic data are inadequate to determine goshawk population trend (Kennedy 1997; USFWS 1998; Squires and Kennedy 2006).

Montana's state rank for the northern goshawk is S3, which is "Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas." It is listed as a Montana Species of Concern. No population estimates are really available for FNF or the Region 1. However, USDA-FS (2006b) extrapolated the 2005 regional goshawk survey effort in which the proportion of Primary Survey Units (PSUs) with goshawks present in road-accessible lands was between 0.33 - 0.39 for 114 PSUs. This survey effort across road-accessible NFS lands in the Northern Region estimated goshawks were present in 39% of the territory-sized sample units (95% CI = 29% - 50%). Although the survey design did not estimate goshawk occupancy rates for any individual National Forest, it did indicate that goshawks were fairly common and widely distributed across managed areas of the U.S. Forest Service Northern Region, including the FNF. The high rate of goshawk presence in the roaded part of R1 estimated as the result of this survey is consistent with Samson's review of short-term goshawk viability in R1. Samson (2005, amended 2006) showed that the Forests and the Region as a whole had not decreased to a critical 20-30% threshold of historic habitat remaining on the landscape and that forested ecosystems are more extensive now than in historic times. Kowalski estimated the number of PSUs to have goshawks present in the road-accessible portion of the Region was 4,075 with a range of 2,099 to 6,175 at the 95% confidence level. These numbers may be somewhat reasonable as even though roadless areas were not surveyed due to limitations of time and money, often the more remote areas are also less tree covered and productive (Clough 2000). Also during these surveys, 7 new nests were discovered indicating reproduction is occurring. A conclusion from this one-year study was goshawks are not exceedingly rare.

Northern Goshawks are highly secretive and are most easily detected during the breeding season when they aggressively defend their nests and young. While their defensive behavior at nests facilitates capture-recapture studies of breeding individuals, population monitoring is difficult because individuals often forgo breeding, or their nests fail early in a breeding season. Even in years of high productivity, mark-recapture studies can be prohibitively expensive because population sampling requires large field crews and multiple nest visits to many breeding territories to capture and recapture breeding goshawks and young (Reynolds et al. 2005). Squires and Reynolds (1997) also reported that fidelity to breeding territories is often difficult to determine because of the problems associated with finding all of the alternate nests in the territories.

The northern goshawk is well distributed across the FNF, with 44 "positive" observations recorded from 1982-2000 (including observations of nests and young), and numerous nesting and other observations reported from 2000-2010 (USDA-FS 2016c).

Habitat modeling done by the Northern Region, USDA Forest Service, based on research results involving goshawk nesting, post fledging, and foraging habitat, and using Forest Inventory and Analysis (FIA) information, produced a summary of habitat estimates for the northern goshawk by National Forest and aggregated to the Province and Regional levels (Samson 2005). The original Samson 2005 tables are updated with numbers from USDA-FS (2008b) and shown in Table 9.

Table 9. Summary of habitat estimates for the northern goshawk by National Forest in the Northern Region using the Northern Region northern goshawk habitat relationship models and FIA.

	National Forests	**Model Results (acres)***		
		Nest	**Post-fledging area**	**Foraging**
	Flathead NF	3,828	34,449	560,749
Northern Rocky Mtn. Ecol. Province	Idaho Panhandle, Clearwater, Flathead, Kootenai, Lolo	126,349	400,104	3,779,928

	National Forests	Model Results (acres)*		
		Nest	Post-fledging area	Foraging
Middle Rocky Mtn. Ecol. Province	Beaverhead-Deerlodge, Bitterroot, Helena, Lewis & Clark, Nez Perce	157,850	915,531	2,374,067
Southern Rocky Mtn. Ecol. Province	Custer, Gallatin	11,565	145,391	406,434
USDA-FS Region 1	**Region Total*** (due to averaging totals do not add up)	**314,419**	**1,590,589**	**6,565,805**

* The Ecological Province habitat estimates include only National Forest System lands (Samson 2005 updated USDA-FS 2008b).

Habitat for the northern goshawk is abundant in the Northern Region, and is abundant by National Forest and by Ecological Province. However, it appears the FNF (3,828 ac, 34,449 ac, and 560,749 ac respectively for nest, PFA and foraging habitat), and a couple of other Forests do have naturally limited habitat based on the vegetation analysis and Montana Natural Heritage Program (NHP) occupancy data. In addition, the comparison of the relative forest composition and structure in 1938-1942 to current in the composition and structural (large tree) characteristics important to the northern goshawk show a major trend (or increase) favorable to the goshawk (Samson 2005, updated). Another important component is distribution of habitat. Region 1 modeling (Samson 2005, updated) demonstrated that northern goshawk habitat is well distributed by National Forest.

Clough (2000) compared nest density between undeveloped landscapes and landscapes where past timber harvest had been heavy, and found no difference in nest density. Hillis et al. (2003) identified the potential vegetation types, size classes, canopy closures, and elevations that best described 328 nests in USDA-FS Region 1. They then applied those criteria to remaining portions of Region 1 that had not been rigorously sampled. This suggested that out of 2,350 6th code hydrologic units (HUC6s) in the Region (watersheds 10,000 to 30,000 acres in size) no less than 1,599 (or 68%) had habitat sufficient to support at least one nesting territory. Fine-scale validation of random HUC6s showed substantially more goshawk nest habitat than predicted. Hillis, Clough, and Lockman (2003) suggested goshawks may not warrant a sensitive species status in Region 1. The work of Kowalski (2006b) and Samson (2005, updated) provided the data and evaluation on which to base reconsideration of the goshawk status as sensitive. Based on these works, the Forest Wildlife Biologists across the Region recommended the removal of the goshawk from the Region's Sensitive Species List in 2007 [USDA-FS 2007c (updated Dec 2009)].

An analysis of old growth forest on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007, monitoring item #15 and #69) found that the 2003 estimated percentage of old growth on all forested lands on the FNF is 11.6% with a 90% confidence interval of 9.6-13.8%, based on the regional FIA summary database. This estimate was re-affirmed in the 2008-2010 FNF monitoring report (USDA-FS 2010). An analysis of vegetation composition, structure, and landscape pattern on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007, monitoring item #68) reported on changes in vegetation since the time of the Amendment 21 analysis in 1999. During this time, approximately 0.9% of the FNF was changed from a mid or late seral condition to an early seral condition due to regeneration harvest and 0.8% of FNF had undergone fuels treatment. The 2008-2010 FNF monitoring report added that fire has caused sizeable changes on the landscape in the last decade, dwarfing the impacts due to forest management, particularly in the watershed of the North Fork of the Flathead River (USDA-FS 2010).

As part of the FNF Forest plan revision analysis, current conditions for goshawk nesting habitat were assessed by modeling the Natural Range of Variation (NRV) going back about 1000 years and projected for the next 50 years, including anticipated changes in climate and fire suppression (USDA-FS 2016c). Goshawk nesting habitat was modelled based upon habitat type group, including tree size classes greater than 10" d.b.h. and canopy cover greater than 40% (Greenwald et al. 2005). This effort was limited to nesting habitat because it was assumed that post-fledging and foraging habitat is not limiting. The model predicted that habitat under current Forest Plan direction would stay within the range of NRV over the 5 decade time period (USDA-FS 2016c).

Threats

This species may be negatively affected by timber harvest or other vegetation management, by disturbance too close to nesting sites, or by fire suppression that creates forest structure that is too dense for hunting. In the past, regeneration harvest likely resulted in loss of goshawk nesting habitat on NFS lands as well as state and private timber lands. In the future, goshawk habitat could be negatively impacted by loss of large trees for nesting on all lands if drought, insects/disease, or stand-replacing wildfires are extensive and frequent in the future, but habitat suitable for hunting of prey species may be increased by wildfires. Future effects due to timber harvest as well as climate changes would depend upon distribution across the landscape. Because goshawks are highly territorial, their nesting density is naturally low. They can nest in relatively small, isolated parcels of nest habitat and research has shown that landscapes fragmented by timber harvest support nest densities comparable to un-fragmented landscapes. Goshawks are highly mobile and are likely to be able to find sufficient nesting habitat.

There is still considerable interest in the health of the northern goshawk population despite the decision to not list the species in 1998 (USDI-FWS 1998). Threats are perceived to be a result of logging and the loss of habitat and displacement. Because no published guidelines based on empirical data exist for mesic forests in the northern Rocky Mountain region, management principles from the southwestern guidelines are applied. Current forest management guidelines developed for the southwestern United States recommend no commercial timber harvest within a 12-hectare goshawk nesting area and at least 60% of the 420 acre area surrounding the nest in equal portions of larger vegetation structural stages (Reynolds et al. 1992). But Moser and Garton (2009) found that goshawks reoccupied breeding areas that were altered by timber harvest and they did not move any further to alternate nests in subsequent years than birds in unharvested breeding areas, suggesting that the harvest within nesting areas was not enough to cause goshawks to abandon breeding areas. Moser and Garton (2009) recommend that timber harvest can be implemented within goshawk nest areas in their north Idaho study area after the post-fledging dependency period, which ends about August 15, with no short-term adverse effects on subsequent year's reproduction, provided that 39% of the 420 acre breeding area is left in larger vegetation structural stages with a canopy closure of 70%.

One concern remains that the species may be old growth dependent but the USDI-FWS (1998) stated that while goshawks frequently use stands of old-growth and mature forest for nesting, overall the species appears to be a forest habitat generalist in terms of the variety and age-classes of forest types it uses to meet its life history requirements. McGrath et al. (2003) point out some controversy that still exists surrounding considering the goshawk as an indicator species for old growth. Severe stand-replacement fire or insect epidemics will reduce habitat suitability in the short term by reducing canopy cover in localized areas but in the long term, these disturbance events create foraging habitat components such as snags, down logs, openings, and edges. In warm and dry forest communities, reducing tree densities by "thinning from below" may reduce forest fuels while simultaneously creating stand conditions that are favorable for goshawk foraging (Reynolds et al. 1992, Squires and Kennedy 2006).

There are still uncertainties associated with goshawk management as evidenced by the controversy caused by the Reynolds et al (1992) guidelines. Beier et al. (2008) however stated that the assumptions behind the guidelines remain a set of largely untested hypotheses and based on his study question the benefit to goshawks. Depending upon the forest condition, some, little, or no active management may be necessary to reach desired conditions (large trees, snags, downed logs, woody debris, and herbaceous layer) for goshawks and prey (Reynolds and others 1992). Drennan and Beier (2003) concluded these guidelines, which provide for a more open stand condition and overall improvement of forest health, may not be justified in terms of how goshawks select habitat. However the guidelines should not negatively affect goshawks though. Based on a review of goshawk ecology Squires and Kennedy (2006) conclude that many life history attributes remain unknown and it is a daunting task to gain precise, scientific knowledge on top-level predators such as the goshawk. Specific effects of forest management on prey populations and prey availability vary by species, and those effects, which could be positive or negative, are not well understood (Squires and Kennedy 2006).

<u>Conservation</u>

Region 1 (USDA-FS 2007c updated in 2009) developed the Northern Goshawk Northern Region Overview, Key Findings, and Project Considerations. Project considerations follow the rationale and the guidelines found in Reynolds et al. (1992) that prescribe a forest structure to promote abundant goshawk prey species for the nest area, post-fledgling area and foraging that area are expected to maintain the necessary components for goshawk habitat. Some results show the importance of maintaining a natural stand condition (large trees, snags, downed logs, woody debris, and herbaceous layer) with human avoidance around the nest during the nesting season, but some cutting may be allowed outside the breeding season Lõhmus (2005). Underburning can have a positive effect on goshawk habitat (Squires and Ruggiero 1996; Graham, et al. 1997) when it is consistent with natural forest patterns. A variety of forage opportunities are available in the mosaic of burn severities and unburned areas within the fires perimeters, and in the adjacent unburned forest. Goshawks may use the edges of burned areas for hunting. Foraging opportunities may increase between burned and unburned areas outside the fire due to the edge effect created by the fire. The edge will likely increase passerine bird diversity and reduce hiding cover, which will benefit goshawk (Smith 2000).

Forest plan direction appears to be adequate to ensure that key habitat features of post-fledgling areas and foraging areas will be maintained, including large and very large trees used for nesting, snags and down logs associated with prey, open understory conditions for hunting, and interspersion of habitat. Current forest plan direction to maintain, restore, and recruit old growth forest to an amount that is within the HRV, and to protect riparian areas, is expected to continue to provide adequate amounts of nesting habitat. Vegetation management actions that restore open-canopy structure in existing old growth are likely to reduce the suitability of the stands as goshawk nesting habitat if natural conditions or habitat features are not maintained. However, the overall acreage of such treatments is expected to be small (estimated to affect less than 2% of the existing old growth over a 10-year period). Forest plan direction to protect riparian areas and to consider the habitat needs of old growth associated wildlife species will minimize the impact of this type of restoration treatment on goshawks. Under current direction, sufficient nesting habitat will be maintained to sustain the goshawk population on FNF.

Federal laws and direction applicable include the National Forest Management Act and National Environmental Policy Act. The Forest Service is required by the National Forest Management Act to “provide for a diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 U.S.C. 1604(g)(3)(B)]. The Forest Service’s focus for meeting the requirement of NFMA and its implementing regulations is to assess habitat and provide species diversity. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on species based on specific issues raised during potential projects. Various species will be emphasized for surveys in the next few years according to the 2005 MFWP Comprehensive Fish and Wildlife Conservation Strategy. Species with greatest inventory needs include the Northern Goshawk (MFWP 2005).

Evaluation of Current Situation on NFS Lands

Summary for the northern goshawk and its habitat:

- Appears to be limited on FNF based on nesting habitat and occupancy records, but is widely distributed and relatively abundant in western Montana and across North America.
- There is no evidence that habitat is limiting the population, or that significant curtailment of the species’ habitat or range is occurring.
- Is probably little affected by vegetation management on the forest and region scales (see introduction), while there is an increase in the extent and connectivity of forested habitat.
- Forest management can either degrade or enhance goshawk habitat while goshawk response to disturbance from vegetation treatments and human activities near nests is inconclusive and may vary from complete site abandonment and nest failure to some level of tolerance.
- Researchers suggest silvicultural and prescribed fire treatments should be consistent with natural forest patterns and fire regimes.
- Habitat in R1 is abundant and well distributed where it occurs naturally, and more forest, and therefore nesting habitat, exists on today’s landscape than what occurred historically (Samson 2006a; USDA-FS 2008b). There have been substantial increases in connectivity for forested habitat since Euro-American settlement (Samson 2006a). Not a single known nest

site in R1 is isolated from other known nests by more than the goshawks' estimated dispersal distance.

- Management actions with potential habitat effects undergo an internal assessment during NEPA project planning.
- Is conserved through forest management standards associated with riparian habitat, old growth habitat, down woody material/snags, and the best available goshawk nest site and post-fledgling conservation science (Reynolds et al. 1992).
- Region 1 has developed project considerations to use as a tool to analyze project impacts for the northern goshawk [USDA-FS 2007c (updated Dec 2009)].

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

While other factors outside of the Forest Service's control (i.e. interspecies competition) may have negative effects on northern goshawks, based on the above analysis management actions taken on the FNF will provide for the habitat composition, structure and processes for the northern goshawk population according to the suitability and capability of NFS lands. There appears to be little risk of population loss due to forest management activities and the species will remain present and well distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

NORTHERN LEOPARD FROG *(Lithobates (Rana) pipiens)*

The northern leopard frog is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, this frog is an indicator that the needs of other species that use small wetland habitats are met. The northern leopard frog does not appear to be present on FNF despite an abundance of apparently suitable habitat and numerous amphibian surveys. Potential frog habitat is conserved through forest management standards associated with riparian and fisheries habitat management.

Natural History

Habitats used by northern leopard frogs in Montana include low elevation and valley bottom ponds, stock reservoirs, lakes, creeks, stream pools, potholes, and marshes (Hendricks 1999), often with few or no trees. Eggs and tadpoles usually develop in shallow warm and still water. In winter, northern leopard frogs usually are found inactive on the bottom of deeper streams and ponds. Separate sites are generally used for breeding and overwintering, sometimes in the same pond.

Population, Habitat, and Distribution

The northern leopard frog historically ranged from Newfoundland and southern Quebec, south through New England to West Virginia, west across the Canadian provinces and northern and central USA to British Columbia, Oregon, Washington, and northern California, and south to Arizona, New Mexico, and extreme western Texas (Rorabaugh 2005 as reported in USFWS 2009e). However, since the 1970s the northern leopard frog has experienced significant declines throughout its range, particularly in the western United States and Canada (several sources as reported in USFWS 2009e). The species tends to become less abundant the further west one proceeds. The northern leopard frog is now considered uncommon in a large portion of its range in the western USA, and declines of the species have been documented in most western States (Rorabaugh 2005 as reported in USFWS 2009e). Northern leopard frogs have been documented in most Montana counties (MFWP 2005). The Montana GAP Program predicted the distribution of the northern leopard frog habitat across the state. The model used an upper elevation limit of 7,400 feet, and was based on presence of permanent waters. Predicted habitat is distributed across most of the state, representing about 16% of the total area, although this is an overestimate (Hart et al. 1998).

In an assessment of the Upper Columbia River Basin, the northern leopard frog was expected to have an “unfavorable” outcome under current management direction (Quigley et al. 1996). There was a concern regarding loss of viability, both when considering only lands administered by Forest Service and BLM, and when considering all ownerships (rating of 4.7 and 4.8, respectively, on a scale of 1 to 5). Widespread range contractions over the past few decades are documented from Montana, Alberta, Wyoming, Colorado, Idaho, Washington, and Oregon (Werner and Reichel 1996). On the FNF, potential year-round habitat for the northern leopard frog is identified as Riparian Landtypes NL1A and NL1E (Table 3a under boreal toad). These are nearly level riparian habitats in flat valley bottoms and with relatively fine substrates.

Northern leopard frogs in the western Montana mountains are a Species of Concern with a state rank of S1, “at high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.” The Great Plains (eastern Montana) population has a S4 state rank and is not a Species of Concern.

Historically, the northern leopard frog was widespread in Montana, but appears to have been extirpated throughout much of the western part of the state. Voucher and observation records demonstrate widespread extirpation of northern leopard frogs in western Montana during the 1980s (Maxell et al. 2003). While apparently extirpated from much of western Montana, it appears that suitable habitat is still present. Werner (2003) reported on western Montana surveys from 1993-2001. 88 surveys were conducted at 31 historical sites with no *R. pipiens* found. A total of 1324 non-historical sites were surveyed at least once during the same time period, about half of which were considered suitable for *R. pipiens*. *R. pipiens* was found at two locations whereas the Columbia spotted frog (*R. luteiventris*) was found at 497 locations.

Due to adjacent sightings (a lake complex near Kalispell and set of small ponds about 30 miles to the northwest near Eureka), and near the Nine Pipe National Wildlife Refuge, this species is listed on the FNF Sensitive Species List, but has not been documented on the FNF since a 1950 record in the Swan Valley. Extensive amphibian surveys have been completed on or very close to the FNF over the past 14 years (see the Boreal Toad section, above). This FNF-led citizen-science effort has surveyed 465 different sites, most of them multiple times, with numerous records of spotted frogs, Pacific chorus frogs, and larval long-toed salamanders, but no sign of leopard frogs.

Threats

As reported in USFWS (2009e) habitat loss and degradation is the primary threat to all frogs in the western United States (Bradford 2005) and a principal threat to northern leopard frogs in the western United States (Smith 2003; Rorabaugh 2005). The petition asserts that the northern leopard frog is threatened with loss and degradation of habitat due to livestock grazing, agricultural development, urban development, oil and gas development, road development, poor forestry practices, groundwater pumping, mining, and invasive species. Various explanations for the population decline have also been offered, including those typically suggested for all amphibians, such as increased fungi and parasite infection, global warming, ozone depletion, acid rain, over-collection, immune system suppression, introduced exotic predators and diseases, pesticides, and chemical pollution (Hay and Jennings 1986, Maxell 2000, Werner and Reichel 1996). Habitat modifications may also be to blame, including development, road building, timber harvest, fisheries management practices, drainage or cleaning of natural ponds, removal of cover, damming and grazing. Fish introductions into historically fishless lakes have been shown to adversely impact spotted frogs in Central Idaho, and may similarly adversely impact leopard frogs. Explanations for the abrupt localized extirpation of leopard frogs include drought, fragmentation of needed complex habitats, habitat loss to agriculture, and the introduced chytrid skin fungus disease and infection of eggs by *Saprolegnia*, a worldwide pathogen of fishes (Holt et al. 1994).

Conservation

On July 1, 2009, following a review of the petition, the FWS found that a petition to list the species presented substantial scientific or commercial information indicating that listing the western U.S. population of northern leopard frog may be warranted. With that publication, they initiated a status review of the species, and will issue a 12-month finding to determine if listing the species throughout all or a significant portion of its range is warranted (USDI-FWS 2009e). Forest Plan direction provides substantial riparian habitats protection and is somewhat redundant (multiple laws providing overlapping protection). Riparian areas surrounding perennial streams are managed under direction for MA-12 and MA-17, and forest-wide Inland Native Fish Strategy (INFISH) direction. Livestock grazing is very limited and not an issue on the FNF. Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states “Project decisions will not result in loss of species viability or create significant trends towards federal listing.”

The 2005 MFWP Comprehensive Fish and Wildlife Conservation Strategy emphasized inventory of species with greatest needs which included the Northern Leopard Frog (MFWP 2005). 722 occurrences are entered into the Montana Tracker database from 2005-2010 with only 3 located in Lincoln County from northwestern Montana. Annual surveys occur during FNF "Herp Days" with cleaning of equipment prior to surveys, and FNF herbicide spray program is limited in scope, extremely protective within riparian areas, and administered by certified applicators.

Evaluation of Current Situation on NFS Lands

Summary for the northern leopard frog and its habitat:

- Does not appear to be present on FNF despite apparently suitable habitat, and has declined in many parts of its range,
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation, and
- Is conserved through forest management associated with riparian and fisheries standards.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
45. Change in Water Quality
46. Water Yield Change from Timber Harvest
47. Sediment Yield

There are factors outside of the Forest Service's control (acid precipitation, pathogens, ozone thinning, global warming, etc.) that may have negative effects on this species. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the northern leopard frog. Despite survey efforts and apparently suitable habitat the species has not been documented on FNF in over 50 years.

PEREGRINE FALCON *(Falco peregrinus anatum)*

The peregrine falcon is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, this falcon is an indicator that the needs of other species associated with lakes and rivers are met, particularly those that use cliff areas. This falcon has recovered, been removed from federal listing, and is increasing in numbers in Montana. Three eyries occur on the FNF, representing an expanding population. It is conserved through forest management standards associated with protection of riparian habitats and for endangered, threatened, and sensitive species. There appears to be little risk of population loss and species viability will be maintained.

Natural History

Peregrine falcon habitat is varied and includes open situations from tundra, mountains, open forested regions, foothills, and seacoasts where there are suitable nesting cliffs and human population centers (Natureserve 2006). When not breeding, occurs in areas where prey concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports. Outside of the tundra, nests are often on a ledge or hole on face of rocky cliff or crag. Ideal locations include undisturbed areas with a wide view, near water, and proximity to plentiful birds for food. Artificial nest sites include tall buildings, bridges, rock quarries, and raised platforms.

<u>Population, Habitat, and Distribution</u>

The peregrine is found throughout the world and including North America. 2003 monitoring results indicate that there were 3,005 nesting pairs in the USA, Canada, and Mexico compared to 1,750 pairs at the time of delisting in 1999 (USDI-FWS 2006). Peregrines are a summer resident found on national forest system lands throughout the Region in Idaho, Montana, and North Dakota. The subspecies of peregrine falcon (*Falco peregrinus anatum*) occurring locally underwent the most dramatic decline from after WWII to 1970, because of contamination of prey by persistent residue organic compounds (especially DDT), and not habitat decline.

Between 1977 and 1991 peregrines increased in Idaho and Montana from approximately 5 active eyries to over 38 active known eyries. Since 1994-2009 the known numbers of active eyries in Montana has steadily increased from 13 to 84 (Montana Peregrine Institute 2010 website) with 79 eyries used for fledge counts and 176 young produced (2.2 young/active eyrie) in 2009. The 2009 numbers exceeded the 15-year average Montana productivity of 1.9 young/territory from 1994-2008. Young fledge in Montana from 6/15 to 8/11, with a peak between 6/28 and 7/15. More intensive statewide surveys would likely find more eyries. About 295,500 acres of “suitable unoccupied” habitat were identified across the Northern Region.

Three known pairs nest on or near the FNF are associated with Flathead Lake (Wood’s Bay Eyrie) the Flathead River near Hungry Horse (Badrock Canyon Eyrie), and Tally Lake (Tally Lake Eyrie) and are cooperatively monitored. From annual monitoring records the Wood’s Bay pair is one of the most productive eyries in the state with 2 young fledged from the site in both 2009 and 2010. Fifteen primary potential nesting sites are located across the FNF.

Montana’s state rank for the peregrine falcon is S3, “potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas.”

<u>Threats</u>

The use in the environment of the chemical pesticides containing organochlorine, mainly DDT, dramatically reduced the nesting success of peregrine falcons in the Northern Hemisphere and caused the population to crash from after WWII and up to the 1970s (USDI-FWS 1998b). Organochlorines can affect peregrine falcons either by causing direct mortality or by adversely affecting reproduction by causing eggshell thinning. Since DDT was banned in North America DDT levels of contamination have decreased but have not been eliminated and some lingering residues remain in the environment. Peregrine falcons are susceptible to a number of diseases and parasites. Mammals and other raptors are known to prey on peregrine falcons (USDI-FWS 1998b).

Conservation

The most significant factor in the recovery of the peregrine falcon was the restriction placed on the use of organochlorine pesticides. Use of DDT was banned in Canada in 1970 and in the United States in 1972 (USDI-FWS 1998b). Since implementation of these restrictions, residues of the pesticides have significantly decreased in many regions where they were formerly used. Consequently, reproductive rates in most surviving peregrine falcon populations in North America improved, and numbers began to increase (USDI-FWS 1998b). The peregrine falcon was classified as Endangered but was delisted in 1999. It is now treated as a sensitive species on the FNF. Recovery for the peregrine has been achieved and populations in Montana are being monitored after delisting according to the delisting process to check on nest site occupancy and reproduction every 3 years over a 15 year period ending in 2015.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states "Project decisions will not result in loss of species viability or create significant trends towards federal listing."

Forest Plan direction relevant to peregrine conservation includes page II-23 and Amendments 8, 11, and 13. This includes restricting human activities near the nest site during nesting season. FNF nest sites are monitored annually.

Evaluation of Current Situation on NFS Lands

Summary for the peregrine falcon and its habitat:

- Is present on FNF, in Montana and across North America.
- Has recovered, been removed from federal listing, and has increasing numbers in Montana.
- Population and nest success have been monitored on an annual basis.
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation.
- Is conserved through forest management standards associated with protection of riparian habitats and for endangered, threatened, and sensitive species.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

19. Forest bird distribution, productivity, and survivorship monitoring stations.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
23. Number of Nest Management Plans completed for bald eagles and peregrine falcons.
24. Number of peregrine falcon nesting territories and annual productivity.
26. Fish Habitat; Need for Fish Habitat Improvement

29. Fish Habitat; Water Temperature
45. Change in Water Quality
47. Sediment Yield
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Other factors outside of the Forest Service's control (residual agricultural pesticides, etc.) may have negative effects on this species. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure, and processes according to the suitability and capability of NFS lands for the peregrine falcon. There appears to be little risk of population loss due to forest management activities and the species will remain present and distributed across FNF. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

WESTERN (TOWNSEND'S) BIG-EARED BAT (*Corynorhinus townsendii*)

The Townsend's big-eared bat is a Sensitive Species and Management Indicator Species on the FNF. Among other species and habitats, this bat is an indicator that the needs of many other bat species are met, as well as other species associated with dead trees, caves, and small wetlands. Surveys on the FNF did detect four sites confirmed or suspected used by Townsend's big-eared bats. This species may inhabit a variety of environments and on the FNF is conserved through forest management standards associated with protection of caves and riparian resources, and old-growth and snag retention management. There appears to be little risk of population loss and species viability will be maintained.

Natural History

Western big-eared bats' most typical habitat is arid western desert scrub and pine forest regions. Caves, tree cavities, rocky outcrops, buildings, or mines may provide sites for roosting, communal nurseries, or winter hibernation (Reel, et al. 1989; Tuttle and Taylor 1994). In the spring and summer, females form maternity colonies in mines, caves, or buildings, while males roost individually. In winter, these bats hibernate in caves and abandoned mines. Habitat use in Montana has not been evaluated in detail, but it seems to be similar to other localities in the western United States. Caves and abandoned mines are used for maternity roosts and hibernacula; use of buildings in late summer also has been reported (MFWP 2005). Habitats in the vicinity of roosts include Douglas-fir and lodgepole pine forests, ponderosa pine woodlands, Utah juniper-sagebrush scrub, and cottonwood bottomland (MFWP 2010e). Most caves and mines in Montana appear to be too cool in summer for use as maternity roosts. This species forages after dark on moths and other insects high in living forest canopy near wet meadows (Dobkin, et al. 1995). Potential foraging habitat for the western big-eared bat is identified as Riparian Landtypes NL1A and NL1E (Table 3a above, for Boreal Toad). These are nearly level riparian habitats in flat valley bottoms and with relatively fine substrates.

Population, Habitat, and Distribution

Western big-eared bats are found throughout western North America, from British Columbia south to Oaxaca, Mexico, with two endangered subspecies in isolated areas in the Ozark and Central Appalachian regions of the United States (BCI 2006 website). The western big-eared bat is uncommon to rare with a widespread distribution, and a notable decline has been reported in the western United States (Dobkin, et al. 1995). The complete extent of the range of Townsend's big-eared bat in Montana is unknown, due to the limited survey effort across many areas. It has been documented in over 20 counties (voucher specimens from 14) and on both sides of the Continental Divide (MFWP 2010e). Townsend's big-eared bat is present year-round in Montana, where it has a state rank of S3, "Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas."

Extensive surveys for all species of bats were conducted across the Northern Region from 2005-2008. Big-eared bats are known to occur on all forests and grasslands in Region 1 from North Dakota to Idaho (Beth Hahn, pers. comm. 2011). Surveys on the FNF caught, saw or suspected Townsend's big-eared bats at eight sites on or along the boundary of the FNF (MTNHP 2013). It is likely that additional foraging habitat is present on FNF, and possible that undiscovered roosts, maternity colonies and hibernacula are present in Montana (MFWP 2010e). There appears to be sufficient snag roosting habitat near numerous wet-meadow feeding areas, although snags may not provide characteristics associated with the large communal roosts often limiting this species occurrence in an area. Over 40 sites were surveyed throughout FNF during 2005-2008 with 11 bat species caught, seen or heard. Townsends big-eared were present or suspected at four sites on FNF. This rarity of sightings extended to other survey locations throughout the Region during the period also. Much more suitable habitat likely exists in remote, hard to access sites in wilderness such as the Bob Marshall complex.

Townsend's big-eared bats are difficult to monitor and survey for and use different habitats at different times of the year. This species is "quite effective at avoiding mist-nets" and is difficult to detect acoustically because it uses low-intensity calls (WBWG 2005).

Threats

Potential roosting cavities can be lost with the removal of large snags and trees. Heavy equipment operation and road construction can compromise or damage unknown caves or abandoned mines. Destruction of habitat has occurred due to the belief that bats were rabies vectors. Big-eared bats are extremely sensitive to disturbance at their roosting sites and have suffered severe population declines throughout much of the U.S (BCI 2006). Cave exploring has resulted in extirpation of bats due to improperly timed recreational activities. Vandalism, mining and pesticides are also threats (BCI 2006). Activities that have threatened bat habitat in other areas may not be occurring, or may not be occurring to the same degree, in Montana. Better distribution and occupancy information for this species was found during the 2005-2008 surveys.

Conservation

Public awareness education has been singled out as the best defense against all threats to bats (BCI 2006). LRMP objectives and standards for cave protection, snag retention, and protection of water quality and riparian habitat, benefit this species. As protection of riparian and cave habitats is substantial, and somewhat redundant (multiple laws providing overlapping protection), the apparent scarcity of western big-eared bats on the FNF cannot be attributed to failure to protect feeding, roosting, or nursery habitat. Riparian areas surrounding perennial streams are managed under direction for MA-12 and MA-17, and forest-wide Inland Native Fish Strategy (INFISH) direction. In addition, the FNF LRMP has provisions to protect cave habitat from disturbance. Abandoned mines are evaluated for bat habitat potential and installation of a bat compatible gate is considered. FNF has erected bat gates at some bat habitat locations and provides information and education to the public in the form of presentation and the use of a “bat trunk.”

It is unknown but some biologists believe it is inevitable that white nose syndrome will arrive in the west. That threat to Western bats from white nose syndrome has grown since mid-April 2009, when white nose syndrome was confirmed for the first time west of the Mississippi River. The Forest Service and Region 1 are working with national agencies and groups in developing decontamination and closure policies for access and cave-access permits.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the FNF LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states “Project decisions will not result in loss of species viability or create significant trends towards federal listing.”

Various species were emphasized for surveys according to the 2005 MFWP Comprehensive Fish and Wildlife Conservation Strategy. Species with greatest inventory needs included the Townsend’s Big-eared Bat (MFWP 2005) which was part of the regional and statewide surveys conducted by Forest Service and State personnel.

<u>Evaluation of Current Situation on NFS Lands</u>

Summary for the western big-eared bat and its habitat:

- Presence is incomplete for Montana, but widely distributed across Forest Service Region 1 and western North America.
- Is a sensitive species and management actions with potential effects undergo an internal biological evaluation.
- All potential cave or mine habitat that might be affected by FNF management (such as mine reclamation or cave access improvement or restriction) are preceded by bat surveys. Most closures include “bat-friendly” gates, even when no bats are located.
- Is conserved through forest management standards associated with protection of caves and riparian resources, and old-growth and snag retention management.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.

21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Other factors outside of the Forest Service's control (residual agricultural pesticides, etc.) may have negative effects on this species. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for the Western big-eared bat. There appears to be little risk of population loss. The FNF should maintain a viable population within the natural habitat and contribute towards the viability of the species as a whole.

WOLVERINE (*Gulo gulo luscus*)

The wolverine is a Sensitive Species on the FNF. Among other species and habitats, the wolverine is an indicator that the needs of other species that use remote mountainous areas are met, particularly those associated with cirque basins, avalanche chutes, and deep snow. The wolverine occurs on the FNF and in other areas of northwest Montana, and is connected to the populations that extend into Canada and Alaska. In December 2010 (USDI-FWS 2010a), the Fish and Wildlife Service (FWS) found the North American wolverine occurring in the contiguous United States is a distinct population segment (DPS) and that addition of this DPS to the Lists of Endangered and Threatened Wildlife and Plants was warranted but precluded by higher priority actions to amend the Lists. On February 4, 2013 the USFWS issued a proposed rule to list the wolverine in the contiguous U.S. as a threatened species under the ESA (78 FR 7864)(USDI-FWS 2013). However, on August 13, 2014, the USFWS withdrew its proposal to list the wolverine as a threatened species under the Endangered Species Act under the Endangered Species Act (USDI-FWS 2014). USFWS concluded that sufficient information was lacking to make a reliable prediction about how wolverines are likely to respond to impacts to habitat that may result from climate change, and whether such habitat changes will pose a threat in the future. Additionally, the best available scientific and commercial information indicated that other potential stressors such as land management, recreation, infrastructure development, and transportation corridors do not pose a threat to the wolverine (p. 47539). In a recent ruling in the Montana Circuit Court, USFWS was instructed to review that decision. The wolverine returned to the USFS Regional Forester's Sensitive Species List.

While the wolverine was under consideration as a Proposed Species, the Forest Service needed to determine whether any action carried out by the agency requires conferencing under the ESA regulations at 50 C.F.R. 402.10. Conferencing provisions of the regulations applied, and these are quite different than the provisions for consultation. Specific language pertaining to conferencing in the ESA regulations 50 C.F.R. 402.10(a) states: "Each Federal Agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed." Conferencing is not required (and no formal exchange of documentation with the USFWS will occur) for anything less than a jeopardy determination. For project-level analyses on the FNF, the May 2014 Programmatic Biological Assessment for North American Wolverine (USDA-FS 2014) and the May 2014 response from the USFWS (USDI-FWS 2014) are applied.

Natural History

In the contiguous United States, wolverine year-round habitat is found at high elevations, especially in cirque basins and avalanche chutes that have food sources such as marmots, voles, and carrion (Hornocker and Hash 1981, p. 1296; Copeland 1996, p. 124; Magoun and Copeland 1998, p. 1318; Copeland et al. 2007, p. 2211; Inman et al. 2007a, p. 11 in USDI-FWS 2013). Deep, persistent, and reliable spring snow cover is the best overall predictor of wolverine occurrence in the contiguous United States (Aubry et al. 2007, pp. 2152–2156; Copeland et al. 2010, entire in USDI-FWS 2013). Inman and others (2013) found a link between persistent snow and wolverine foraging strategy. This correlates well with wolverine year-round habitat use across wolverine distribution in North America and Eurasia at both regional and local scales (Copeland et al. 2010, entire; Inman et al. 2012a, in USDI-FWS 2013). Wolverine year-round habitat use also takes place almost entirely within the area defined by deep persistent spring snow (Copeland et al. 2010, pp. 242– 243 in USDI-FWS 2013), although evidence of a requirement for deep snow beyond a den site is lacking (USDI-FWS 2014).

Natal dens have been found in remote, high elevation cirque basins in late winter (Copeland 1996, Foresman pers. comm.), and in large woody debris within subalpine forest (Copeland et al. 2003). Young are born in a den among rocks or tree roots, in a hollow log, under a fallen tree, or in dense vegetation, including sites under snow. Cold habitat, and a persistent snow layer needed for complex snow tunnels during the denning period (15 Apr – 15 May) appears essential for reproductive dens (Copeland et al. 2010; Aubry, et al. 2007; and Schwartz, et al. 2007) and genetic dispersal paths (Schwartz et al. 2009).

Wolverine densities and home range size are believed to be closely linked to food availability and differences in habitat quality (Hornocker and Hash 1981). Wolverines are opportunistic feeders and consume a variety of foods. They primarily scavenge carrion and have an excellent sense of smell that enables them to find food beneath deep snow (Hornocker and Hash 1981). Female wolverines forage close to den sites in early summer, progressively ranging further from dens as kits become more independent (May et al. 2010). Wolverines in Glacier National Park had average adult male home ranges of 496 km^2 (193 mi^2) and adult female home ranges of 141 km^2 (55 mi^2)(Copeland and Yates 2006). Wolverines have a high dispersal capability and seem to be able to move successfully through highly altered landscapes. In the contiguous United States, valley bottom habitat appears to be used only for dispersal movements and not for foraging or reproduction (USDI FWS 2014).

“Wolverine home ranges generally do not occur near human settlements, and this separation is believed to be largely due to differential habitat selection by wolverines and humans” (May et al. 2006, pp. 289–292; Copeland et al. 2007, p. 2211 in USDI-FWS 2013). In one study, wolverines did not strongly avoid developed habitat within their home ranges (May et al 2006, p. 289). Wolverines may respond positively to human activity and developments that are a source of food.

They scavenge food at dumps in and adjacent to urban areas, at trapper cabins, and at mines (LeResche and Hinman 1973 in Banci 1994 p. 115; Banci 1994, p. 99 in USDI-FWS 2013).

In summary, based on the best available science, the FWS concluded that wolverines do not avoid human development of the types that occur within suitable wolverine habitat and that wolverines may disperse or move across areas of human development (USDI-FWS 2013, USDI-FWS 2014).

Population, Habitat, and Distribution

Wolverines are found in northern Europe, northern Asia, and northern North America. The wolverine is probably one of the rarest mammals and least known large carnivores (Ruggiero et al. 1994) and least studied (Ruggiero et al. 2007). The species experienced significant population declines throughout its range in the conterminous United States during late 1800s and early 1900s, primarily due to trapping, shooting, and poisoning of predators, activities that were widespread in much of its occupied habitat through the 1930s (Aubry et al. 2007). In Alaska and Canada, the wolverine retains its original distribution in the arctic region and in the western mountains and boreal regions (Ruggiero et al. 1994).

According to the USFWS (2014a), "wolverine records from 1995 to 2005 indicate that wolverine populations currently exist in the northern Rocky Mountains and that the bulk of the current population occurs here. Within the area known to currently have wolverine populations, relatively few wolverines can coexist due to their naturally low population densities, even if all areas were occupied at or near carrying capacity. Given the natural limitations on wolverine population density, it is likely that historic wolverine population numbers were also low" (Federal Register / Vol. 79, No. 156 / Wednesday, August 13, 2014 / Proposed Rules). The FNF lies within the Northern Rocky Mountains area assessed by the USFWS. Population growth and expansion has been documented in the North Cascades and Northern Rocky Mountains (USFWS, 2014a).

There is very limited information on wolverines in the lower 48 states. The proposed rule (USDI-FWS 2013 p. 7868) stated, "Wolverines naturally occur in low densities with a reported range from one animal per 65 km2 (25 mi2), to one animal per 337 km2 (130 mi2)(Hornocker and Hash 1981, pp. 1292– 1295; Hash 1987, p. 578; Copeland 1996, pp. 31–32; Copeland and Yates 2006, p. 27; Inman et al. 2007a, p. 10; Squires et al. 2007, p. 2218). In addition, wolverines are rarely and unpredictably encountered where they do occur (Ruggiero, et al. 2007). No systematic population census exists over the entire current range of wolverines in the contiguous United States, so the current population levels and trends are not definitely known (USDI FWS 2014). However, there is evidence that their population is increasing and that wolverines are expanding both within areas currently occupied as well as suitable habitat not currently occupied (USDI FWS 2014). In 2014, the FWS concluded that "effective population size estimates for wolverines do not suggest that small population size is currently a threat to the DPS, but they do suggest that populations are low enough that they could be vulnerable to loss of genetic diversity in the future" (USDI-FWS 2014b).

Aubry et al. (2007) note the wolverine range in the contiguous US had contracted substantially by the mid-1900s as recent surveys indicate that wolverines occupy (and are essentially limited to) the most remote montane regions of Idaho, Montana, Washington and Wyoming. Due to vast expanses of wilderness and remote habitat, wolverines survived years of unlimited hunting and trapping in northwest Montana until 1975, when trapping and a quota system began (Hornocker and Hash 1981). Historically, the contiguous U.S. population would have been larger than it is today due to the larger area occupied by populations when the southern Rocky Mountains and Sierra Nevada were occupied at full capacity. But because of natural limitations on where wolverines live the FWS (USDI-FWS 2010a) believe that densities and population levels in the northern Rocky Mountains and North Cascades, where populations currently exist, are likely not substantially lower than population densities in these areas prior to European settlement.

Wolverines have a Montana state ranking of S3: "Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas" (MNHP 2014). In their proposed rule (USDI-FWS 2013), the FWS stated that wolverines likely exist as a metapopulation in the contiguous United States. A metapopulation is a network of semi-isolated populations, each occupying a suitable patch of habitat in a landscape of otherwise unsuitable habitat. Wolverines are territorial and naturally occur at very low densities. "Wolverine records from 1995 to 2005 indicate that wolverine populations currently exist in the northern Rocky Mountains and that the bulk of the current population occurs here. Within the area known to currently have wolverine populations, relatively few wolverines can coexist due to their naturally low population densities, even if all areas were occupied at or near carrying capacity. Given the natural limitations on wolverine population density, it is likely that historic wolverine population numbers were also low" (Inman et al. 2007a in USDI-FWS 2013).

The FWS (2013) indicated that densities and population levels in the northern Rocky Mountains are not lower today than they were historically. "The northern Rocky Mountain population (north of Wyoming) was reduced to historic lows or possibly even extirpated during the early 1900s, and then increased dramatically in the second half of the 1900s as predator control efforts subsided and trapping regulations became more restrictive (Aubry et al. 2007, p. 2151 in FWS-USDI 2013). This increase likely indicates a population rebound from historic lows in this period."

In 2009, the effective population for wolverines in the Rocky Mountains was calculated to be 35 (Schwartz et al. 2009). This effective population size is exceptionally low which means that this is a species that seems to be able to persist at extremely low numbers. The fragmented nature and distribution of wolverine habitat in the lower United States results in a contiguous U.S. population that is more vulnerable to extirpation because of lack of connectivity between subpopulations. This contributes to inbreeding and reduces the chances of recolonization of habitat patches after local extinction. 250-300 wolverines in the contiguous United States account for probably < 2% of the entire *G. g. luscus* population. The USDI-FWS (2010a) concluded that the wolverine population in the contiguous United States is both discrete and significant under DPS policy.

Wolverine populations in the northern Rocky Mountains appear to be connected to each other at the present time through dispersal routes that correspond to habitat suitability (Schwartz et al. 2009). Linkage zones are defined as "places where animals can find food, shelter, and security while moving across the landscape between suitable habitats… Wolverines prefer to travel in habitat that is most similar to habitat they use for home-range establishment, i.e., alpine habitats that maintain snow cover well into the spring. There is no evidence that wolverine dispersal is affected by infrastructure development (Schwartz et al. 2009, p. 3227 in USDI-FWS 2013). In the contiguous United States, wolverines must cross unsuitable habitats to achieve connectivity among subpopulations, which is required to avert further genetic drift and continued loss of genetic diversity (Copeland 2007).

On the FNF, trapping records and observations of wolverines or their tracks have been received for every major drainage, with over 275 wolverine reports since 1933. During the 10 year period from 2003-2012, wolverines have been reported at a minimum of 25 separate locations, distributed across FNF (NRM Wildlife database, 2013).

With respect to habitat modeling and effects on wolverine habitat, the proposed listing rule assessed the best available science (USDI-FWS 2013). The USFWS used a composite model for habitat mapping across the U.S. based upon the work of two scientists (Inman et al. 2012, entire; Copeland *et al*. 2010, entire). The USFWS assessed wolverine habitat within the four States that currently harbor wolverines (Montana, Idaho, Oregon (Wallowas) and Wyoming), and estimated 124,014 km^2 (47,882 mi^2) of wolverine habitat exists. Ninety-four percent (135,396 km^2; 52,277 mi^2) of total wolverine habitat is in Federal ownership, with most of that managed by the U.S. Forest Service. Based on the FWS's analysis of the methods and analysis used by the authors, they conclude it "constitutes the best available information on the likely impact of climate change on wolverine distribution in the contiguous United States" (USDI-FWS 2013). The Inman *et al.* (2012) model is based on snowpack and also incorporates other habitat variables such as terrain ruggedness and some aspects of human development. The two models "result in estimates of wolverine habitat that are very similar across most of the range of wolverines in the contiguous United States" and there is "general agreement between the two models" (USDI-FWS 2013). The distribution of modeled persistent, deep snowpack across the Flathead Forest is displayed in Table 10.

A large amount of suitable wolverine habitat, (about 28 percent for the states of Montana, Idaho, and Wyoming), occurs within Federal wilderness areas in the United States (USDI-FWS 2013). The USFWS stated that Federal ownership of much of occupied wolverine habitat protects the species from direct losses of habitat and provides protection from many forms of disturbance; large areas of their range occurs in designated wilderness and national parks (USDI-FWS 2013). As such, a large proportion of existing wolverine habitat is protected from direct loss or degradation by the prohibitions of the Wilderness Act. Outside of designated wilderness, but still on Forest Service-managed lands, wolverines occur mainly in alpine areas where their habitat is generally offered more protections from timber harvest than would otherwise be the case in lowland areas. On the FNF, about 56% of wolverine habitat (areas with persistent spring snowpack) is in designated Wilderness and about 11% is in designated roadless areas (Table 10a). In addition, restrictions on road and over-snow vehicle use enacted for grizzly bear habitat protection through Amendments 19 and 24 (FNF LRMP 1986, as amended), provides additional secure habitat for wolverines.

Table 10a. Modeled Wolverine Habitat on the Flathead National Forest (FNF)

Summary of All Modeled Wolverine Habitat [1]	**Acres (% of FNF Habitat)[2]**
Wolverine Habitat within FNF Administrative Boundary	1,442,449
Wolverine Habitat within FNF Wilderness Areas[3]	808,490 (56%)

Wolverine Habitat within FNF Roadless Areas (MA2 Management Areas)	156,658 (11%)
Wolverine Habitat not within FNF Wilderness and Roadless Areas	477,301 (33%)
Summary of Highest Quality Modeled Wolverine Habitat (persistent spring snow 7 years out of 7)	
Highest Quality Wolverine Habitat within FNF Administrative Boundary	313,445
Highest Quality Wolverine Habitat within FNF Wilderness Areas[3]	207,372 (66%)
Wolverine Habitat within FNF Roadless Areas (MA2 Management Areas)	33,988 (11%)
Wolverine Habitat not within FNF Wilderness and Roadless Areas	72,085 (23%)

[1] FNF GIS Persistent Spring Snowpack 1 to 7 years out of 7 years (based upon Copeland, 2010—see GIS Metadata).
[2] All numbers are approximate
[3] Mission Mountain, Great Bear, and Bob Marshall Wilderness Areas

For the FNF LMP revision effort, modelling revealed there are approximately 1.7 million acres of modelled wolverine habitat, based upon the composite Inman/Copeland model (USDI-FWS 2013a, 2014a; Woods, Morey, & Mitchell, 2014). The majority of modelled habitat occurs in the Bob Marshall Wilderness complex, with lesser amounts in the Swan and Mission Mountain portions of the Swan Valley, as well as the Whitefish Range portion of the North Fork and Salish Mountains. In order to assess the effects of LRMP revision alternatives on wolverine habitat, the FNF used two models, because there is scientific disagreement and uncertainty over available models and the appropriate scale for their use (e.g., range-wide, den site). For total wolverine habitat, we used the composite model adopted as best available science by the USFWS for wolverine habitat across the United States (USFWS, 2013a, 2014a) which incorporated the work of two groups of scientists (Inman et al. 2011; Copeland et al., 2010). For effects on maternal denning habitat, we used the model developed by Copeland and others (2010). Modelled maternal denning habitat encompasses about 655,000 acres or 27% of all Forest lands (Table 10b). FNF LRMP A24 direction for motorized over-snow vehicle use would support key ecosystem characteristics for wolverines because activities which have a risk of disturbing reproductive females with offspring would be suitable on no more than 11% of modelled maternal denning habitat (USDA-FS 2016c).

Table 10b. Modelled maternal denning habitat by alternative with persistent spring snow (5, 6, or 7 years out of 7)(USDA-FS 2016c).

Over-snow use in modelled denning habitat with persistent snow 5, 6, or 7 years out of 7	Alternative A
Acres where motorized over-snow vehicle use is suitable	74,048
Acres where motorized over-snow vehicle use is not suitable	580,644
% of total where motorized over-snow vehicle use is suitable	11%

Table 10c shows motorized over-snow vehicle use according to the three separate season (denning season for grizzly bears, late spring season, and year-long) across the FNF. T hese numbers reflect the Flathead National Forest Winter Motorized Recreation Plan Amendment 24 and any differences in acres and miles are due to GIS mapping realignments and updates to database and not because of changes in routes or areas on the ground.

Table 10c. Miles and acres of over-snow routes and areas within the Forest by season allowed[1]

Season of Use Allowed	Motorized Over-Snow Vehicle Routes	Motorized Over-snow Vehicle Areas
Dec 1 to March 31	295 miles	457,133 acres (19 %)
April 1 to Nov 30[2]	623 miles	53,905 acres (2 %)
Year-long[3]	1046 miles	240,337 acres (10 %)

1. Numbers in this table reflect the Flathead National Forest Winter Motorized Recreation Plan Amendment 24; any differences in acres and miles are due to GIS mapping realignments and updates to database and are not because of changes in routes or areas on the ground.
2. Miles and acres are open for a portion of this time period, snow conditions permitting. In addition, they are open December 1 to March 31.
3. Year-long routes are open to motorized over-snow use conditions permitting.

Threats

According to the USDI FWS (2014), "Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat" to the conservation of the species. The available scientific and commercial information does not indicate that potential stressors such as land management, recreation, infrastructure development, and transportation corridors pose a threat to the wolverine in the contiguous United States. Additionally, the scale at which most land management decisions (including Forest Service vegetative management activities) occur is relatively small compared to the average size of a wolverine home range and although impacts to individual animals may occur, they do not rise to the level to be a threat to the population (USDI FWS 2014).

In their proposed ruling, the FWS determined global climate change to be the primary threat to the species, and that legal and incidental trapping of wolverines are substantial threats in concert with climate change; Management activities of land management agencies, for example, winter recreation and timber harvest, were not identified as threats (USDI-FWS 2013). However, the 2014 rule (USDI-FWS 2014) stated that "After further consideration, and with input from peer review, public comments, and the expert panel workshop, we no longer conclude that impacts from climate change pose a risk of extinction to the wolverine DPS".

There is uncertainty on effects to wolverines from climate change which is associated with scale. At a region-wide scale, the preliminary Northern Region Adaptation Partnership risk assessment for the wolverine (NRAP 2015) states that there is no evidence that wolverines can persist in areas distant from extensive areas of spring snow, thus, adaptive capacity appears to be low. The authors estimated that the magnitude of effects would be low in 2030 and moderate in 2050, with a high likelihood of effects across all time periods. Across the northern region as a whole, losses of current levels of persistent spring snowpack are estimated to be around 30% by mid-century (NRAP, 2015). McKelvey and others (2011) stated: ‘‘although wolverine distribution is closely tied to persistent spring snow cover (Copeland et al. 2010), we do not know how fine scale changes in snow patterns within wolverine home range may affect population persistence.’’ The USFWS concurred with this finding, stating, “an improved understanding of how microclimatic variation alters the habitat associations of wolverines at fine spatial scales is needed” (USFWS 2014a, p. 47527).

At a more localized scale of the northern Rockies, potential effects of future climate changes on persistent spring snow is less certain. According to the models, northern Montana (including the Forest), the southern Bitterroot Mountains and the Greater Yellowstone Ecosystems retain significant spring snow in the next 50 years whereas central Idaho is projected to lose significant spring snow (McKelvey et al., 2011). There are variations in climate models, but models generally indicate earlier snowmelt in the Northern Rockies in the future, a pattern that has been ongoing since at least the 1950s. While wolverines are known to spend the majority of time at high elevations, the degree to which earlier snowmelt may affect wolverines and connectivity of meta-populations is also uncertain. Wolverines are a highly wide-ranging species and recent research in GNP has demonstrated that habitat connectivity between Glacier National Park, the Forest, and Canada currently supports wolverine movement (Copeland & Yates, 2006).

Secondary threats were also identified (“genetic and demographic effects of small population size and the effects of harvest, both intentional permitted trapping and incidental trapping as non-target species”) but the FWS determined that these “do not rise to the level of a threat to the DPS when considered in combination with the effects of climate change” (USDI-FWS 2014).

Wolverine trapping harvest during the 30 years prior to 2007 was considered stable, with a statewide average of 10.5 wolverines taken annually during this time period (see planning record exhibit 00398, pp. 35-39). Then, based on research findings by Squires and others (Squires et al., 2007), wolverine trapping quotas were adjusted downward for the two large ecosystems in the state; the Northern Continental Divide Wildlife Management Unit (WMU 1) and Greater Yellowstone (WMU 3). Further analysis tied to genetic make-up of the Montana wolverine population, the issue of maintaining population connectivity, and recognizing the core population areas of three major ecosystems (now including central Idaho wilderness area) led to additional regulation changes in 2008. These adjustments included delineating four WMUs and reducing quotas to a statewide total of five animals, with a central Montana WMU quota of 0, to promote population connectivity among the three major ecosystems in the state where harvest is allowed (see planning record exhibit 00398, pp. 35-39). In December 2012, a state district court judge in Helena granted a temporary restraining order that blocked the opening of Montana’s 2012–13 wolverine trapping season and it remained closed with a quota of “0” in 2013–14 and 2014–15. The future of wolverine trapping is unknown. The Forest is within wolverine management unit 1 (WMU 1) (northwest Montana), which had a quota of three wolverines (with a maximum of one female) in 2010 and has had a quota of 0 since then (MTFWP, 2015a). Since trapping was suspended in 2011, there has been one wolverine trapped accidentally (T. Thier, MFWP, personal communication, 2016). Glacier National Park, encompassing about a million acres adjacent to the Forest, is closed to trapping. Any cumulative effects to the wolverine resulting from trapping and winter recreation access on all lands are highly uncertain at this time, but investigations are ongoing. Management on the Forest has supported wolverine populations in the past and is expected to continue to do so in the future.

The FWS (USDI-FWS 2014) also analyzed human disturbance, applying four categories: (1) Dispersed recreational activities with primary impacts to wolverines through direct disturbance (e.g., snowmobiling and heli-skiing); (2) disturbance associated with permanent infrastructure, such as residential and commercial developments, mines, and campgrounds; (3) disturbance and mortality associated with transportation corridors; and (4) disturbance associated with land management activities such as forestry, or fire/fuels reduction activities. The FWS stated that the scale at which these activities occur is relatively small compared to the average size of wolverine's home range and, due to the small scale of the habitat alteration involved in these sorts of activities, concluded that the overall impact of these activities is not significant to the conservation of the species. On FNF, about 59% of modelled year-round wolverine habitat (USFWS 2013a, 2014a) is in designated wilderness, where motorized uses (including snowmobling, helicopter-assisted skiing or snowboarding, and trackster-assisted skiing or snowboarding) are not allowed. Non-motorized uses on the Forest are not restricted, but are limited by steep terrain that is often heavily timbered and/or brushy, except on trails and open roads. Because much of the wilderness area on the Forest is remote, it is also difficult to access for non-motorized winter recreation. Even outside designated wilderness areas, non-motorized use is limited by the distance a person can travel in a day, unless greater distance is facilitated by provisions such as an overnight hut-to-hut system or helicopter transport.

The FWS also assessed the adequacy of existing regulatory mechanisms. Their review of the regulatory mechanisms in place at the national and state level demonstrates that the short-term, site-specific threats to wolverine from direct loss of habitat or disturbance by humans, are, for the most part, adequately addressed through State and Federal regulatory mechanisms.

The FWS decision to not list the wolverine (USDI-FWS 2014) states:

- At this time, we do not have sufficient information to make a reliable prediction about how wolverines are likely to respond to the effects of climate change. Wolverines have recently expanded in the North Cascades and the northern Rocky Mountains from sources in Canada, and are continuing to expand into suitable habitat not currently occupied and/or occupied by a few individuals, including into Colorado, California, Wyoming, and Utah. New information estimated that current population size is approximately half of capacity (Inman *et al.* 2013), confirming that continued population growth and expansion is possible and even likely (Aubry *et al.*2007, p. 2151).
- "Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the DPS".
- "In the tri-State area of Idaho, Montana, and Wyoming, most documented crossings of Federal or State highways were done by subadult wolverines making exploratory or dispersal movements (ranges of resident adults typically do not contain major roads) (Packila et al. 2007, p. 105 [*in* USDI-FWS 2014]). Roads in the study area, typically two-lane highways or roads with less improvement, were not absolute barriers to wolverine movement".
- "Wolverines frequently used un-maintained roads for traveling during the winter, and did not avoid trails used infrequently by people or active campgrounds during the summer" (Copeland et al 2007, p. 2211)".

- "We know of no examples where human activities such as dispersed recreation have occurred at a scale that could render a large enough area unsuitable so that a wolverine home range would be likely to be rendered unsuitable or unproductive. Given the large size of home ranges used by wolverine, most human activities affect such a small portion that negative effects to individuals are unlikely. These activities do not occur at a scale that is likely to have population-level effects to wolverine."
- "Wolverines have been documented to persist and reproduce in areas with high levels of human use and disturbance, including developed alpine ski areas and areas with motorized use of snowmobiles (Heinemeyer 2012, entire [*in* USDI-FWS 2014])".
- "Little scientific or commercial information exists regarding effects to wolverines from development or human disturbances associated with them. What little information does exist suggests that wolverines can adjust to moderate habitat modification, infrastructure development, and human disturbance. In addition, large amounts of wolverine habitat are protected from human disturbances and development, either legally through wilderness and National Park designation, or by being located at remote and high-elevation sites. Therefore, wolverines are afforded a relatively high degree of protection from the effects of human activities by the nature of their habitat".
- "Wolverines are known to successfully disperse long distances between habitats through human-dominated landscapes and across transportation corridors. The current level of residential, industrial, and transportation development in the western United States does not appear to have precluded the long-distance dispersal movements that wolverines require for maintenance of genetic diversity. We do not have information to suggest that future levels of residential, industrial and transportation development would be a significant conservation concern for the DPS".
- "…the best available scientific and commercial information does not indicate that other potential stressors such as land management, recreation, infrastructure development, and transportation corridors pose a threat to the DPS."

On or adjacent to the FNF, land use activities such as agriculture, domestic livestock grazing, forest management, developed/dispersed recreation, and human development are present. Wolverines are probably little affected by vegetation management on FNF and in the Region (USDI-FWS 2014). Availability of extensive, interconnected roadless and wilderness habitat on the FNF (see Table 10 above) reduces the potential threats to the wolverine including the risk of mortality due to trapping, vehicle collisions and other types of human-related mortalities; as well as the potential negative effects of fragmenting small populations.

The USFWS assessed effects of a variety of human activities that can affect wolverines or their habitat. The USFWS stated that "few effects to wolverines from land management actions such as grazing, timber harvest, and prescribed fire have been documented. Wolverines in British Columbia used recently logged areas in the summer and moose winter ranges for foraging (Krebs et al., 2007, pp. 2189-2190). Males did not appear to be influenced strongly by the presence of roadless areas (Krebs et al., 2007, pp. 2189-2190). In Idaho, wolverines used recently burned areas despite the loss of canopy cover (Copeland 1996). Management activities such as timber harvest and prescribed fire do occur in wolverine habitat; however, for the most part, wolverine habitat tends to be located at high elevations and in rugged topography that is unsuitable for intensive timber management. Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species" (USFWS, 2014a). The USFWS also stated that it is unlikely that wolverines avoid the type of low-use forest roads that generally are found in wolverine habitat. Based on the best available science, the USFWS concluded that wolverines do not avoid human development of the types that occur within suitable wolverine habitat and that there is no evidence that wolverine dispersal is affected by infrastructure development (USFWS, 2014a).

Regulated trapping in Montana has been managed by FWP through scientifically based regulations intended to sustain furbearer populations. Traditionally, FWP and the FWP Commission reviewed and refined trapping regulations to ensure the use of best management practices for trapping activities. In the past, licensed trappers provided FWP with important information to assist in state wildlife management programs. Legal trapping in Montana in the recent past removed an average of 10.5 individuals from the population each year (MTFWP 2007), and harvest mortality was reduced due to regulatory changes in 2008 (MTFWP 2008). For the 2008 to 2009 trapping season, Montana Department of Fish, Wildlife, and Parks adjusted its wolverine trapping regulations again to further increase the geographic control on harvest to prevent concentrated trapping in any one area, and to completely stop trapping in isolated mountain ranges where small populations are most vulnerable (MTFWP 2010). The quotas for wolverine were reduced to a maximum of five since the 2008/2009 and open only in three of four wolverine management units. There was also a female sub quotas and harvest could be less depending upon the number of females harvested (Daily Interlake 8/18/08 and FWP 2009 Furbearer Regulations). The 2012-2013 wolverine trapping season was cancelled after a temporary restraining order was issued by a district court judge against the wolverine trapping season in Montana (Missoulian, 11/30/2012).

With respect to unintended trapping of wolverines, the FWS stated that the current known level of incidental trapping mortality is low: "We note that it is unknown whether or not increased trapping of wolves associated with wolf trapping regulations recently approved by the states of Idaho and Montana would be likely to result in increased incidental trapping of wolverines. Idaho began its wolf trapping program in the winter of 2011–2012, and Montana began theirs in the winter of 2012–2013. These wolf trapping activities are relatively new in the DPS area, and we do not yet have reliable information on the level of incidental take of wolverines that may result from them" (USDI-FWS 2013). On the FNF, potential negative effects from trapping predators to reduce livestock depredation are minor, because there are only 2500 permitted animal unit months on 111,000 acres across over 2 million acres of National Forest lands (with actual numbers even less due to 3 allotments in vacant status).

Conservation

A variety of Federal laws and direction are applicable to the wolverine on the FNF, including (but not limited to) the National Forest Management Act (NFMA 1976) and the National Environmental

Policy Act (1969). FNF LRMP Amendment 24 limits the percent of potential wolverine habitat where snowmobiling is allowed by FNF LRMP direction to about 15%. This amendment was implemented in 2006 and resulted in direction for over-snow winter motorized recreation, including when and where winter motorized recreation could occur. A24 designated specific routes and play areas as well as seasons for motorized over-snow use per §212.81 of the Travel Management Rule. Amendment 21 (A21) has standards to conduct analyses to review programs and activities to determine their potential effect on wildlife species. A21 also states "Project decisions will not result in loss of species viability or create significant trends towards Federal listing." Amendment 19 to the FNF LRMP improves security habitat through access management. Approximately 69% of the FNF is designated as wilderness, proposed wilderness, or inventoried roadless areas and by 2008, the open road density across the FNF had decreased to about 0.4 miles per mi^2 (approx. 1458 miles/3688 mi^2).

The Flathead Forest will continue to assess effects of its activities upon the wolverine and will continue to monitor the distribution of wolverines and other forest carnivores, in cooperation with other agencies and private cooperators, as directed by A21. A study by Vinkey (2003) provides a glimpse into the difficulty of surveying for low density forest carnivores such as fishers, wolverines and lynx. As an example, Vinkey (2003) studied fishers in the Cabinet Mountains of northwest Montana for 3 seasons; using traps, tracks and track plates to detect species. During this time he encountered 126 martens, 30 fishers, 6 wolverines and 1 lynx. As Banci (1994) summarized, wolverines are solitary animals, with males and females occupying large home ranges that often do not overlap among sexes. As an animal of the higher elevation backcountry, roadless lands, and wilderness, they are rare in northwest Montana and not often seen.

On the Forest, studies or research on wolverine occurred in the 1980s (Hornocker & Hash, 1981). Hornocker and Hash conducted telemetry research on 24 individual wolverines over a five year period within a study area making up about 1300 km2 of the Flathead National Forest. Their study area was primarily made up of the South Fork of the Flathead drainage and secondarily portions of the Sun, Swan, and Middle Fork of the Flathead River drainages. About one-half the study area was used for timber harvest and recreational purposes while the other half was Wilderness. Hornocker and Hash found that wolverines were at relatively high densities in the South Fork of the Flathead River drainage and they concluded the population was stable (Hornocker & Hash, 1981).

Current information for the Forest is based on: 1) reported trapping records, 2) non-invasive monitoring including remote cameras and DNA analysis of hair or scat, and 3) observations/sightings of either the species or tracks recorded in forest or state databases. No recent research that would estimate population levels has been conducted for wolverine on the Forest. The Forest and other cooperators detected a minimum of 13 individual wolverines within Forest geographic areas (based upon genetic analysis of samples collected during non-invasive carnivore monitoring in areas accessible by snowmobile from 2012-2015. The FNF continue to conduct cooperative carnivore surveys, as it has every winter since 2011-2012. These included bait stations with hair traps to collect DNA for species identification. Snow tracking transects included documentation of carnivore tracks and backtracking on suspected lynx, wolverine, and fisher tracks to collect hair, urine, or scat samples for DNA confirmation.

Evaluation of the Current Situation on NFS Lands

Summary for the wolverine DPS and its habitat:

- Occurs as a metapopulation in the northern Rockies. Is present in northwest Montana and on the FNF.
- The FWS estimates that the wolverine population in the contiguous United States numbers approximately 250 to 300 individuals (Inman 2010b, pers. comm.in USDI-FWS 2013) with the bulk of the current population occurs in the northern Rocky Mountains.
- On August 13, 2014, the USFWS withdrew its proposal to list the wolverine as a threatened species under the Endangered Species Act under the Endangered Species Act (USDI FWS 2014).
- While the wolverine was proposed as threatened, the Forest Service determined whether its activities were likely to jeopardize the wolverine.
- The Forest Service is engaged in a cooperative effort to evaluate, study, and conserve the wolverine.
- Regulatory mechanisms currently in place are adequate. Wolverines are conserved through forest management standards and procedures.
- Wolverines can use habitats affected by moderate levels of human disturbance
- Additional protection, especially during the denning time period, is afforded by the significant portion of wolverine habitat that is in designated wilderness area. The FNF is approximately 69% wilderness, proposed wilderness, or inventoried roadless area. Amendment 19 has also improved habitat security through motorized access management. From 1995 through 2011, the FNF has improved grizzly bear security habitat (area >0.3 miles from an open road and >2500 acres in size) by 171,255 acres (267mi^2) (USDA 2012); also contributing to conservation of wolverine habitat.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

16b. Grizzly Bear Habitat (which provides elements of wolverine habitat).
20a. Furbearer trapping records from MFWP.
20b. Distribution of forest carnivores.
21. Number of Sensitive Species Management Plans or Conservation Strategies (including monitoring plan) completed.

In summary, in their decision to not list the wolverine, the USFWS determined that management activities of land management agencies, for example, winter recreation and timber harvest, were not identified as threats to the wolverine population (USDI-FWS 2013). While other factors outside of the Forest Service's control (such as trapping, non-target trapping mortality, effects of global climate change, etc.) may have negative effects on this species, there is little risk of population loss on the FNF. Based on the above analysis, management actions taken on the FNF will provide the habitat composition, structure and processes for the wolverine according to the suitability and capability of NFS lands. The majority of the primary, high quality habitat of this species on the FNF is secure and interconnected. The wolverine is expected to remain present and well distributed across FNF, contributing to the viability of the species as a whole.

BIG GAME MANAGEMENT INDICATOR SPECIES

The FNF LRMP has identified white-tailed deer, elk, and mule deer as "Commonly Hunted Big Game" Management Indicator Species (MIS) that use general forest habitat. Conditions favorable to these three common species would generally benefit other big game species such as moose, black bear, and mountain lion. White-tailed deer, mule deer and elk are all widespread species with high population numbers across the FNF and state of Montana. The State of Montana manages big game species to provide a surplus of animals that can sustain harvest by hunters, so population viability is not a concern.

Natural History

Deer and elk are largely habitat generalists and dependent on disturbances. Differing habitat selection and food preferences appears to reduce the intensity of competition between mule deer and white-tailed deer. On and near the FNF, mule deer are typically found in upland coniferous forests. White-tailed deer are more associated with river and creek bottoms, moist sites, habitat diversity, and denser vegetation, using opening with adjacent cover. Elk mainly use coniferous forests interspersed with openings, such as alpine or marshy meadows, river flats, aspen parkland, brushy clear cuts, or forest edges.

Habitat needs vary throughout the year. Spring, summer, and fall months are important periods when ungulates give birth to and nurse calves and fawns, grow antlers, build body condition, accumulate fat for enduring the winter months, and endure the stress of the big game hunting season. During hunting season, elk appear to require contiguous, nonlinear hiding cover patches over 250 acres in size and more than one-half mile from open roads (Hillis et al., 1991) in order for the elk population to provide continued hunter opportunity and a diverse bull age structure (Youmans 1991). In mountainous regions, all three species migrate to lower elevations for the winter, preferring dense coniferous canopies, moist habitat types, and shallow snow depths.

Population, Habitat, and Distribution

White-tailed deer, mule, and elk are all widespread species with high population numbers. White-tailed deer are widespread and common in many areas throughout the Americas, and mule deer in western North America. Elk were formerly widespread in North America, and are now largely restricted to the west, mostly along the Rocky Mountains. Since the population lows of the early 1900s, big game animals have generally improved in numbers and distribution.

Montana has liberal hunting seasons for all three MIS. In Montana Department of Fish, Wildlife and Parks' (MFWP) 2010 Elk, Mule Deer and White-tail Deer Distribution and Population Estimates there were an estimated 117,880 elk, 281,160 mule deer and 249,001 white-tail deer in Montana (MFWP 2010f). Populations are high enough that all three species are regarded as pests in many rural areas of Montana, causing personal property damage, crop destruction, and innumerable vehicle accidents. Annual population estimates are made by the state through a series of data and models. MFWP follows the philosophy that potential impacts of large predators such as mountain lions, black bears, grizzly bears, and wolves need to be taken into account in elk population management.

The FNF provides a significant amount of year-round habitat for elk, mule deer, white-tailed deer, moose, mountain lions, and black bears. The major fires of 2000, 2003, and 2007 created conditions that reduced canopy snow capture, thermal cover, and security cover for approximately 30 years over thousands of acres on and adjacent to FNF, caused an immediate and short-term reduction in forage, but created increased forage values for the next approximately 30 years. However, since early-seral conditions are less than typical historical levels (USDA-FS 2010), security and thermal cover is still widely available within the forest mosaic. The numerous wet meadows, ponds, seeps, and springs that are well distributed across FNF are also an important characteristic of elk and other big game habitat. White-tailed deer studies in the Salish Mountains, Northwest Montana (MFWP 2006c), confirmed that population trend can be reliably monitored using results of the telephone harvest survey and records of harvested deer at check stations using population reconstruction methodology.

Close to 45% of the elk habitat in Montana is located on NFS lands (MFWP 2010f). The gray wolf has returned to Montana recently and is an effective predator of big game. The effects of the wolf on big game populations are being studied and the impacts on big game populations are debatable.

Threats

Timber harvest, major insect epidemics, and fire typically remove or alter hiding and thermal cover used by large mammals such as deer and elk. Openings can decrease ungulates' ability to travel within their home ranges, as well as making them more vulnerable to predation and hunting. Hunters can displace elk from preferred habitats to larger, less diverse patches of cover (Lyon and Canfield 1991). White-tailed deer are more adaptable to large landscape fragmentation and roading than are elk, and they probably have not been impacted as directly from past human activities. Overgrazing by cattle may degrade habitat, especially in riparian areas. Winter snow accumulation may strongly affect populations. White-tailed deer studies in the Salish Mountains, Northwest Montana, (MFWP 2006c) confirmed the need to maintain some forest canopy on low elevation forests to yield both thermal and snow intercept benefits to deer during winter. In many areas, wolves, coyotes, or domestic dogs are important predators.

Conservation

The issues surrounding deer and elk are all focused on producing adequate numbers of deer and elk for hunting and/or wildlife viewing. MFWP establishes population objectives, sets hunting regulations and conducts population monitoring on all lands. Results of the Salish Mountains study (MFWP 2006c) demonstrated that population trend can be reliably monitored using results of the telephone harvest survey and records of harvested deer examined at check stations. In all MFWP Regions and hunting districts statewide, MFWP biologists identify harvestable surpluses of deer and elk, and fix hunting seasons and bag limits designed to remove that surplus. In an absence of hunting, MFWP publicly concludes that surplus would be lost to winter killed mortality. Deer and elk population increases are largely attributable to the designing and enforcing of hunting regulations. More recently, animal populations have increased by regulating hunting pressures on antlerless animals, and the use of conservative hunting seasons. In MFWP Region 1, increases have also been positively affected by recent moderate weather conditions (MFWP 2010).

FNF LRMP Amendment 21 establishes a Forest-wide goal to “provide appropriate habitat and access to maintain desired hunting, fishing, and viewing opportunities, in coordination with the Montana Department of Fish, Wildlife, and Parks.” The FNF LRMP has identified white-tailed deer, elk, and mule deer as “Commonly Hunted Big Game” Management Indicator Species (MIS) that use general forest habitat. Conditions favorable to these three common species would generally benefit other big game species such as moose, black bear, and mountain lion, which are considered under the umbrella of Forest-level MIS evaluation.

The recent wildfires, forest management, and prescribed fire that promote vegetative reproduction favorable for big game browse and forage will ultimately prove beneficial to most populations. Since the late 1980s close 40,000 acres of habitat have been improved via prescribed burns, planting, slashing, and weeding, and about 52,140 acres have been acquired.

Forest plan direction for big game species, aquatic resources and grizzly bears, along with technical assistance from MFWP biologists, ensures habitat components essential for quality big game habitat and reasonable access are maintained. At the forest level, meeting these species’ habitat needs indicates that the needs of species such as black bear, moose, and mountain lion will also be met. Amendment 19 improves habitat security through motorized access management. Concerns over grizzly bear security has resulted in the closure of many roads during the past 2 decades with many hunters considering this change negative, but habitat security for elk and other wildlife has increased (MFWP 2004a). Management considerations for these moist sites have been outlined in the FNF LRMP (pages II-22 and II-23), INFISH/Aquatic Guidelines and Best Management Practices for Forestry in Montana. These apply to all management areas, in accordance with the following selected recommendations from the Coordinating Elk and Timber Management, Final Report of the Cooperative Elk-Logging Study, 1970-1985, January 1985 (Forest Plan Appendix DD).

Research findings and management guidelines for these species are generally consistent. White-tailed deer habitat guidelines written by MFWP biologists recommend maintaining or establishing a zone of “arboreal vegetation” at least 100 feet or 1.5 sight distances from the edge of riparian features (Riley and Cross 1983). They also suggested maintaining upland corridors and encouraging multi-species timber stands. Research indicates that white-tailed deer prefer to have hiding cover within approximately 165 feet (Riley and Cross 1983) and elk approximately 500 feet (Thomas and Toweill 1982) of cover. Timber management to optimize deer habitats in western Montana “should emphasize perpetuation or enhancement of habitat diversity” (Mackie, et al.

1998). Fawn and calf rearing habitat should be associated with high-quality foraging areas and security. It has been recommended that for a stable or increasing population and for opportunities to maintain or harvest large bull elk, at least 30% of an elk herd unit should be in hunting season security area (USDA-FS 1993; Hillis, et al. 1991).

Knapweed, St. John's Wort, and other invasive species now occur in portions of the elk winter habitat and will continue to be treated under a forest-wide weed management plan (USDA Forest Service 2001c).

Evaluation of Current Situation on NFS Lands

Summary for big game and their habitat:

- Big game habitat is quite diverse and widespread across FNF.
- Big game populations are managed primarily through regulated state hunting seasons.
- Big game species and their habitat are conserved through forest management standards associated with access and riparian management, habitat improvement projects, and coordination and technical assistance with MFWP biologists.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

8. White-tailed Deer Populations
9. White-tailed Deer Winter Range
10. Elk and Mule Deer Population
11. Elk and Mule deer Winter Habitat
12. Elk and Mule Deer Winter Range Browse Production
13. Change in Elk Summer Habitat
14. Moose and Mountain Goat Populations

Other factors outside of the Forest Service's control (loss of winter ranges to subdivision, highway road-kill, habituation of white-tailed deer to human development, severe winters, drought, disease, hunting harvests, seasons and bag limits, etc.) may have negative effects on this species. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes for the big game according to the suitability and capability of NFS lands. A sufficient amount of suitable habitat to support species requirements will remain throughout FNF with little risk to viability or to population losses.

NEOTROPICAL MIGRATORY BIRDS

Two of the 71 species of Neotropical migratory birds are Sensitive Species and Management Indicator Species on the FNF, the flammulated owl and the peregrine falcon. Six are old-growth associates, at least 13 are associated with snags or downed wood, and 43 are associated with riparian habitats. 47 of the 71 species (64%) have Montana state ranking of S5 which is "Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range." Based on FNF management direction that applies to the habitats used by the 26 species that have some level of conservation concern, there appears to be little risk of population loss due to FNF actions.

Natural History

Although Neotropical migratory birds use a variety of habitats, two are especially important: riparian because of the availability of water and variety of plant communities, supports elevated numbers and diversity of bird species; and old growth, as it has the highest density and diversity of birds nesting in tree cavities (McClelland and Schmidt 1995). Snags, broken-topped live trees, downed logs, and other woody material are required by a wide variety of these species for nesting, roosting, perching, feeding, and cover.

Table 11a displays the Neotropical migratory bird species that use the FNF for their breeding habitat. This list excludes "accidentals," although some species are on edges of their range and not common.

Table 11a. Neotropical Migratory Birds on the Flathead National Forest. Species list originally from Finch (1991) Migrant landbird species that breed primarily in the Nearctic and winter generally south of the United States-Mexico border. Additional species, NHP rankings, distribution, and habitat information are from Montana Field Guide (http://fieldguide.mt.gov/default.aspx) and Montana Natural Heritage Program's Species of Concern list (http://mtnhp.org/SpeciesOfConcern/?AorP=a) as of July 2012.

Common Name (and Status)	Global, State Ranks (MTNHP 2012) *	Old Growth	Snag/Down Wood	Riparian	Grassland
American Kestrel	G5, S5		X		X
American Redstart	G5, S5B			X	
American Robin	G5, S5B				X
Bank Swallow	G5, S5B			X	X
Barn Swallow	G5, S5B			X	X
Belted Kingfisher	G5, S5B			X	
Black Swift (SOC)	G4, S1B			X	
Black-chinned Hummingbird	G5, S4B				X
Black-headed Grosbeak	G5, S5B				
Bobolink (SOC)	G5, S3B				X
Brewer's Blackbird	G5, S5B			X	
Brewer's Sparrow (SOC) accidental	G5, S3B				X
Brown-headed Cowbird	G5, S5B			X	X
Calliope Hummingbird	G5, S5B				
Cassin's Vireo	G5, S4B				
Cedar Waxwing	G5, S5B			X	
Chipping Sparrow	G5, S5B				
Clay-colored Sparrow.	G5, S4B			X	X
Cliff Swallow	G5, S5B			X	X
Common Nighthawk	G5, S5B			X	X
Common Yellowthroat	G5, S5B			X	X
Cordilleran Flycatcher	G5, S4B			X	
Dusky Flycatcher	G5, S5B			X	
Eastern Kingbird	G5, S5B				X
Flammulated Owl (SOC, Sens, MIS)	G4, S3B	X	X		X
Grasshopper Sparrow (SOC)	G5, S4B				X

Common Name (and Status)	Global, State Ranks (MTNHP 2012) *	Old Growth	Snag/Down Wood	Riparian	Grassland
Gray Catbird	G5, S5B				X
Hammond's Flycatcher	G5, S4B	X			
Hermit Thrush	G5, S5B	X		X	
House Wren	G5, S5B		X		
Lazuli Bunting	G5, S4B				
Least Flycatcher	G5, S5B			X	
Lincoln's Sparrow	G5, S5B			X	
MacGillvray's Warbler	G5, S5B			X	
Merlin	G5, S4			X	X
Nashville Warbler	G5, S5B			X	
Northern Rough-winged Swallow	G5, S5B			X	X
Northern Waterthrush	G5, S5B		X	X	
Olive-sided Flycatcher	G4, S4B			X	X
Orange-crowned Warbler	G5, S5B			X	
Osprey	G5, S5B		X	X	
Peregrine Falcon (SOC, Sens, MIS)	G5, S3			X	X
Red-eyed Vireo	G5, S4B				
Red-naped Sapsucker	G5, S4B		X	X	
Red-winged Blackbird	G5, S5B			X	X
Rose-breasted Grosbeak	G5, SNA				
Ruby-crowned Kinglet	G5, S5B				
Rufous Hummingbird (PSOC)	G5, S4B				X
Savannah Sparrow	G5, S5B				X
Say's Phoebe	G5, S5B				X
Swainson's Hawk (PSOC)	G5, S4B				X
Swainson's Thrush	G5, S5B	X	X		
Tennessee Warbler (PSOC)	G5, S3B			X	X
Townsend's Warbler	G5, S5B	X		X	
Tree Swallow	G5, S5B		X	X	X
Turkey Vulture	G5, S4B				X
Vaux's Swift	G5, S4B	X	X		X
Veery (SOC)	G5, S3B			X	
Vesper Sparrow	G5, S5B				X
Violet-green Swallow	G5, S5B		X	X	X
Warbling Vireo	G5, S5B			X	
Western Kingbird	G5, S5B			X	X
Western Tanager	G5, S5B				
Western Wood-Pewee	G5, S5B			X	
White-throated Swift	G5, S5B			X	X
Williamson's Sapsucker	G5, S4B		X		
Willow Flycatcher	G5, S4B			X	
Wilson's Warbler	G5, S5B		X	X	
Yellow Warbler	G5, S5B			X	
Yellow-breasted Chat	G5, S5B			X	
Yellow-headed Blackbird	G5, S5B			X	X

***Sens** = R1 Sensitive Species; **MIS** = Flathead national Forest Management indicator Species; **X** = associated habitat component; **SOC** = Montana Species of Concern; **PSOC** = Montana Potential Species of Concern.

Montana Natural Heritage Program Ranks: G = species range-wide (global); S = statewide (or Western Montana if they differ); 1 = At high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state; 2 = At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state; 3 = Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas; 4 = Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern; 5 = Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range; B = State rank modifier indicating breeding for a migratory species; SNA = A conservation status rank is not applicable because either the taxa is of hybrid origin, is exotic, introduced, or accidental, it is not confidently present in the state.

Old growth habitat and Snag/Down wood are described in more detail in the following sections. Riparian habitat conditions are provided below. Most of the grasslands on FNF would be considered dry to wet meadows. Species such as the swallows, blackbirds and sparrows would be associated with this habitat. Grazing allotment management direction specifies measures to protect grasslands and meadows from conflicting and competing use by livestock. Under forest plan direction, riparian areas surrounding perennial streams are managed under direction for MA-12 and MA-17, and forest-wide Inland Native Fish Strategy (INFISH) direction. Riparian wildlife habitats across FNF area appear to be functioning well, with numerous and well-distributed lakes, ponds, seeps, streams, and rivers providing a diversity of habitats (Table A, Sirucek and Bachurski 1995).

Table 11b. Riparian Habitats on FS Lands across the Flathead National Forest by acres (and percentages of areas). Very steep confined streams and seasonal near-surface groundwater upland sites not included in this table.

Riparian Landtypes (Sirucek and Bachurski 1995)	Tally Lake District 227,868 ac	Swan Lake District 410,500 ac	Glacier View District 309,342 ac	Hungry Horse District * ~251,000 ac	Spotted Bear District * ~203,000 ac	FNF Total USFS Land * ~1,401,710 ac
LAKE or RESERVIOR (Open water, generally excluding types listed below)	1,721 ac (0.8%)	2,079 ac (0.5%)	256 ac (0.1%)	20,542 ac (8.2%)	3,870 ac (1.9%)	28,469 ac (2.1%)
FL1C, FL2C, FL2D (Valley bottom rivers in silt to gravel substrate in conifer or hardwood communities)	3,519 ac (1.6%)	13,274 ac (3.2%)	7,192 ac (2.3%)	3,055 ac (1.2%)	1,765 ac (0.9%)	28,803 ac (2.0%)
NL1A (Nearly level, poorly drained silt and clay substrate, wetland in subalpine-fir/spruce forest community)	3,083 ac (1.4%)	6,626 ac (1.6%)	489 ac (0.2%)	250 ac (0.1%)	168 ac (0.1%)	10,615 ac (0.8%)
NL1E (Nearly level, poorly drained silt and clay substrate, wetland in sedge/willow community)	7,680 ac (3.4%)	11,420 ac (2.8%)	1,982 ac (0.6%)	1,098 ac (0.4%)	664 ac (0.4%)	22,844 ac (1.6%)
NL2A (Nearly level; sand to gravel substrate; in subalpine-fir/spruce forest community along perennial streams)	1,601 ac (0.7%)	5,176 ac (1.3%)	6,247 ac (2.0%)	3,652 ac (1.5%)	1,486 ac (0.7%)	18,163 ac (1.3%)
SL2A, SL2B, SL3A, SL3B, SL5B (Slightly sloping; sand to boulder substrate; in conifer forest community typically along perennial streams)	2,519 ac (1.3%)	9,240 ac (2.3%)	3,118 ac (1.0%)	2,037 ac (0.8%)	1,309 ac (0.3%)	18,224 ac (1.3%)
MS3A, MS3B, MS4A, MS5A (Moderately steep; boulder or bedrock substrate; in forest community along streams) **	3,102 ac (1.4%)	3,498 ac (0.9%)	927 ac (0.3%)	975 ac (0.4%)	683 ac (0.3%)	6,734 ac (0.5%)
WL5A (springs, seeps, and wet depressions in subalpine-fir forest communities, not along streams) **	2,435 ac (1.1%)	6,486 ac (1.6%)	3,550 ac (1.1%)	2,863 ac (1.1%)	1,243 ac (0.6%)	16,577 ac (1.2%)
Totals	23,204 ac (10.2%)	57,799 ac (14.1%)	23,761 ac (7.7%)	34,477 ac (13.7%)	10,523 ac (5.2%)	150,916 ac (10.8%)

* Riparian Landtypes on the Spotted Bear and Hungry Horse Ranger Districts were not completely mapped, as the Great Bear and Bob Marshall Wilderness Areas were not done.
* * These types are often not included in the Forest-wide GIS coverage but are typically discovered during field surveys and harvest unit layout. These acreages represent minimum amounts.

Population, Habitat, and Distribution

The FNF has participated in two projects that included monitoring populations of migratory birds. The USDA Forest Service Northern Region Landbird Monitoring Program helps understand habitat relationships of landbirds that breed in the northern Rocky Mountains, and assess longer-term landbird population trends that have been combined to determine population trends on a continental, regional, statewide, or physiographic region scale (Hutto 1995a, Hutto and Young 2002, Hutto and Kowalski 2006; Table 11c). This program is one of the largest bird point-count databases of its kind, with sample locations drawn from a wide range of unburned vegetation types across northern Idaho and western Montana. The Monitoring Avian Productivity and Survivorship (MAPS) Program was a cooperative effort with the Institute for Bird Populations (Point Reyes Station, California) with objectives to provide broad scale data on productivity and survivorship, as well as population data and demographic data for landbirds found in local areas or on federally managed public lands. Both of these programs were important to landscape and regional distributional and trend information. Some species in Table 11c are unlikely to be detected by the methods used for Landbird counts or by the MAPS Program.

Table 11c. Observations on Flathead National Forest of Neotropical Migratory Birds Listed in Table 11a that have Conservation Concerns.

Common Name	TES [a], SOC [b], SWAP [c], PIF [d] as of Feb. 2017	Global & State Ranks [e] as of Feb. 2017	R1 Landbird Program on FNF 1994 to 2004 [f]		Max. ¼ w/ obs. with direct evidence of breeding, past 5 years [g]	MAPS on FNF [h]	FNF lands via FWP Tracker but not Landbird nor MAPS [i]
			Abund.	# Years			
Black Swift	SOC, SGCN1/SGIN1, PIF 2	G4, S1B	0	--	1-5	Hilary Meadow and 6-mile Creek	1996 (several in Glacier NP)
Black-chinned Hummingbird		G5, S4B	2	1	25+	--	--
Bobolink	SOC, SGIN3, PIF 3	G5, S3B	0	--	1-5	(Not expected)	1991 (several in Flathead Valley)
Brewer's Sparrow	SOC, SGIN3, PIF 2	G5, S3B	0	--	1-5	--	--
Cassin’s Vireo	PIF 3	G5, S4B	367	7	30+	--	Abundant and widespread
Clay-colored Sparrow.	PIF 3	G5, S4B	0	--	6-10	--	1991 (some SE of Flathead Lake)
Cordilleran Flycatcher	PIF 2	G5, S4B	8	3	1-5	--	--
Flammulated Owl	Sens, SOC, SGIN3, PIF 1	G4, S3B	0	--	1-5	(Not expected)	--
Grasshopper Sparrow	SOC, PIF 2	G5, S3B	2	1	1-5	--	(many SE of Flathead Lake)
Gray Catbird	PIF 3	G5, S5B	2	1	1-5	--	1989, 2001, 2005, 2007, 2008
Hammond’s Flycatcher	PIF 2	G5, S4B	165	7	10+	--	1994, 1998, 2008

Common Name	TES [a], SOC [b], SWAP [c], PIF [d] as of Feb. 2017	Global & State Ranks [e] as of Feb. 2017	R1 Landbird Program on FNF 1994 to 2004 [f]		Max. ¼ w/ obs. with direct evidence of breeding, past 5 years [g]	MAPS on FNF [h]	FNF lands via FWP Tracker but not Landbird nor MAPS [i]
			Abund.	# Years			
Lazuli Bunting	PIF 2	G5, S4B	34	5	1-7	--	1998, 2005
Merlin		G5, S4	0	--	1-10	--	1991, 1998
Olive-sided Flycatcher	PIF 1	G4, S4B	511	7	35+	--	1991, 1993, 1994, 1996 thru 2009
Peregrine Falcon	Sens, SOC, SGCN3, PIF 2	G5, S3	0	--	14-18	(Not expected)	3 eyries on FNF
Red-eyed Vireo	PIF 2	G5, S4B	29	5	5-8	--	1990 thru 95, 1999, 2000
Red-naped Sapsucker	PIF 2	G5, S4B	261	7	22-30	--	1999 (commonly seen & not reported)
Rufous Hummingbird	PSOC, PIF 3	G5, S4B	107	7	9-12	--	1990, 1993, 1994, 1999, 2001, 2005, 2008
Swainson's Hawk	PSOC, PIF 3	G5, S4B	0	--	1-5	(Not expected)	1985, 1997
Tennessee Warbler	PSOC	G5, S3S4B	0	--	4+	--	1994, 2010
Turkey Vulture		G5, S4B	4	3	4-6	(Not expected)	(commonly seen & not reported)
Vaux's Swift	PIF 2	G5, S4B	40	7	9-16	--	1991, 1993, 1994, 1998, 2000, 2008
Veery	SOC, SGCN3, PIF 2	G5, S3B	2	1	10-16	Hilary Meadow, Swan Oxbox2, and Simpson Creek	1995
Williamson's Sapsucker	PIF 2	G5, S4B	43	6	1-4	--	1989, 1994
Willow Flycatcher	PIF 2	G5, S4B	8	4	9-16	--	1990 thru 95 1995, 2001, 2005, 2008

a = Threatened, Endangered, or USFS Sensitive (Sens) designation. b = Montana FWP Species of Concern (SOC) or Potential Species of Concern (PSOC). c = FWP State Wildlife Action Plan (SWAP) status, where SGCN means Species of Greatest Conservation Need and SGIN means Species of Greatest Inventory Need (followed by state conservation status rank). d = Partners In Flight (PIF) score (http://www.rmbo.org/pubs/downloads/Handbook2005.pdf). e = See Table 11a above for explanations of rankings and status. f = Avian Science Center's Northern Region Landbird Monitoring Program, University of Montana (http://avianscience.dbs.umt.edu/data_portal/data_portal.php). g = Montana Fish, Wildlife and Parks and Montana NHP online "Field guide" as of 9/2010, maximum density in a quarter latilong area (http://fieldguide.mt.gov/default.aspx). h = Monitoring Avian Productivity and Survivorship (MAPS) Program as of 9/2010, (http://www.birdpop.org/nbii/nbiihome.asp). i = Montana Fish, Wildlife and Parks and Montana NHP online observation "Tracker" as of 9/2010, (http://mtnhp.org/Tracker/NHTMap.aspx).

FNF management practices would not lead to a loss of viability for any of the species listed in Table 11c above. Many of the species listed in Table 11c are grassland species—bobolink, brewer's sparrow, grasshopper sparrow, merlin, and Swainson's hawk and thus would not be affected by forestry practices. These would be protected by FNF management direction on livestock grazing and by efforts to control noxious weeds. The red-eyed vireo uses open deciduous habitats that are not likely to be logged or intentionally burned and which would be protected by riparian habitat direction. Similarly, the nesting habitat of the veery and willow flycatcher includes swampy, shrubby forest and second-growth forests near water (AOU 1983, Terres 1980). Both would be protected by FNF riparian direction. Vaux's swift typically nest in large hollow live or dead trees and Williamson's Sapsuckers use montane coniferous forest, especially fir and Lodgepole Pine

(AOU 1983). Both of these species, as well as many other snag-dependent migrants, would be protected by FNF snag direction and large proportion of FNF in unroaded conditions.

The black swift, also protected by FNF riparian direction, nests behind waterfalls. In 2004, 32 potential nest sites in northwest Montana were surveyed by NHP (Hendricks 2005). Three of these sites are on or adjacent to FNF. No swifts were observed at any of these three, and only the upper portion of Silver Stairs near Marias Pass and *Little Bitterroot Falls* (on Plum Creek Timber Company land adjacent to FNF) appear to have suitable structure for nesting swifts. Glacier Park offers high potential for black swift nesting, since many apparently suitable waterfalls exist there, and swifts have been observed in the park for many years. Many apparently suitable waterfalls have no trails to them and they are in high-density grizzly bear habitat, so surveys often involve overnight stays and arduous hikes (Hendricks 2005).

The Olive-sided Flycatcher is associated with post-fire habitats and may benefit from recent large stand-replacing fires. However, selectively logged forest may serve as "ecological traps" for olive-sided flycatchers (Robertson and Hutto 2007). Their estimated nest success in selectively harvested forest was about half that found in naturally burned forest, probably a result of the relatively high abundance of nest predators found in the logged forest. However, numbers and patterns over time of observations on and close to the FNF over time (Table 11c) suggest that the olive-sided flycatcher, like the black-chinned hummingbird, Cassin's vireo, Hammond's flycatcher, red-naped sapsucker, rufous hummingbird, and turkey vultures have strong, steady, and well-dispersed populations on the FNF.

Other species in Table 11c seem to have habitat needs consistent with active timber management with riparian protection and pulses of wildfire. Clay-colored sparrows and gray catbirds prefer open shrubs and, thickets along edges of waterways, cut-over and burned areas, and pastures and fields (AOU 1983). The lazuli bunting prefers dry brushy canyon areas, riparian thickets, and open woodland (AOU 1983). The Cordilleran Flycatcher is a riparian-dependent species that uses understory and mid-story vegetation layers (Rich 1999). The Tennessee warbler prefers upland openings, which would continue to be created by logging and/or wildfires across the FNF.

Overall, the FNF provides a considerable diversity of forested habitats, including old growth, snag, and downed wood habitats, avalanche slopes, and a great variety of riparian areas. The existing conditions of habitats important for migratory birds are described in the sections of this document on "Old Growth Habitat and Old Growth Associated Wildlife Species" and "Snags and Downed Woody Material Wildlife Habitat." For more information about wildlife habitat conditions across the FNF relevant to many Neotropical migrants, see the Final Environmental Impact Statement for the FNF LRMP Amendment 21 (USDA-FS 1999). See separate sections of this document for the flammulated owl and the peregrine falcon.

Threats

Many breeding bird populations of the western United States appear to be negatively affected by forest fragmentation in breeding habitat (Hejl et al. 1995). Harvest and excessive tree mortality further contribute to short-term fragmentation (Rotenberry et al. 1995). Habitat loss, increase in high-contrast edge habitat and edge effects, isolation effects, and increased vulnerability to predators (Finch 1991, Turcotte and Desrochers 2003), are all associated with forest fragmentation. Hurteau, et al. (2008) found that treatments in northern Arizona ponderosa pine forests to reduce forest fuels across the range had little effect on avian diversity over their 4-year study but did affect some aspects of species composition and abundance. Hurteau et al. (2008) recommend that given the difficulty of managing for many species with variable responses to forest manipulations, creating a mosaic of forest conditions following forest fuel treatments may be the most suitable approach for a wide range of forest passerines. The parasitic brown-headed cowbird benefits from forest fragmentation, particularly within five miles of livestock grazing (Rotenberry et al. 1995), and may have a negative impact on many Neotropical migrants. Several researchers have found, however, that forest fragmentation tended to increase both brood-parasitism and nest predation rates east of the Rockies, but not in the West (Tewksbury et al 1998).

Gaines, et al. (2010) also showed that overall avian community composition did not change among the thinning, burning or thin/burn treatments in dry forests (ponderosa pine and Douglas-fir with grand fir and western larch occurring at higher elevations) located on the eastern slope of the Cascade Range in Washington. Their results, similar to those reported by Hurteau et al. (2008), did not indicate any significant differences in overall species assemblages among the four treatments, although they did detect different responses by some individual species. As mentioned in Gaines, et al. (2010) a number of studies have investigated the effects of restorative treatments in dry forests on avian species and communities (Germaine and Germaine 2002, Zebehazy et al. 2004, Wightman and Germaine 2006, Gaines et al. 2007, Greenberg et al. 2007) and generally, these treatments have little effect on overall species abundance, richness, or evenness (Zebehazy et al. 2004, Gaines et al. 2007, Greenberg et al. 2007). However, responses of individual avian species vary.

When sufficient downed wood, understory trees, and windfirm live trees and snags are retained and available, adequate habitat can be maintained with timber management. There are expected changes in bird species after harvest. Gaines, et al. (2007) reported positive and negative responses depending upon on the guild. Forest restoration treatments in Ponderosa pine forests located on the east slope of the North Cascade Range were designed to create stand structure and composition similar to pre-settlement forests, which were influenced by a frequent fire regime. Gaines, et al. (2007) detected changes in the density of four of five foraging guilds in response to restoration treatments. Tree seedeaters, low understory and ground insectivores, and aerial insectivores all increased in density in treated stands. Overall, bark insectivores showed no density response to treatments. Tree foliage insectivore density was lower in treated than in untreated stands. Overall avian density and density of neotropical migrants were higher in treated stands. Salvage of fire damaged trees does occur but generally the amount of post fire salvage harvest is limited, and the current amount of forest habitat is surplus to what occurred historically. Logging and tree felling during the nesting season may cause direct mortality.

Fire can cause profound changes in the composition and abundance of plant and animal species as (Smucker, et al. 2005) found almost twice as many bird species increased as decreased significantly in response to a post fire study.

The ecological and economic impacts caused by noxious weeds are numerous and include impacts to water quality, reduction in long-term production of land, loss of native vegetation species, increased erosion, and loss of wildlife habitat (MFWP 2010).

Migratory birds fall victim to a host of other risks including, habitat modifications in transit and on wintering grounds, structure impacts, weather patterns, domestic animals, and vehicle collisions.

Conservation

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds, including nests and eggs, is unlawful. A list of Neotropical migrants protected by the MBTA is provided in 50 C.F.R. 10.13. In January 2001, an executive order was signed outlining responsibilities of federal agencies to protect migratory birds under the MBTA. As a complimentary measure to the Executive Order, the Forest Service and the USDI-FWS entered into a Memorandum of Understanding (MOU) the purpose of which is to strengthen migratory bird conservation through enhanced collaboration between the agencies, in coordination with state, tribal, and local governments. This MOU serves as guidance for the two federal agencies until more detailed direction is developed following the Executive Order. The USDI-FWS published “Birds of Conservation Concern 2002,” which recommends that its lists be consulted in accordance with E.O. 13186. Some migratory birds are covered by state hunting regulations; others are protected by non-game status with the Montana Department of Fish, Wildlife, and Parks.

There are currently no Forest Plan Standards specific to Neotropical migrants. Habitats used by birds are managed with Forest Plan standards associated with other management activities or conservation programs. Some species, such as the flammulated owl, are classified as endangered, threatened, or sensitive, and are discussed in biological assessments or biological evaluations. The MBTA covers many ground-nesting and shrub-nesting birds. Some migratory birds are covered by state hunting regulations; others are protected by non-game status by the Montana Department of Fish, Wildlife, and Parks. Several of the apparently declining species are included in the FNF LRMP Amendment 21's list of Old Growth Associated Species. In addition to maintaining existing old growth, LRMP objectives and standards (added by LRMP Amendment 21) for retention of large snags, coarse woody debris, and restoration of fire as an ecological process are expected to benefit these species. Amendment 21 (1999, pg. 9) states “habitat connectivity for old growth associated species would be provided by adding objectives and standards for retention of large live trees, snags, and coarse woody debris throughout the forest matrix, including timber harvest areas.

Evaluation of Current Situation on NFS Lands

Summary for Neotropical migratory birds and their habitat:

- Neotropical migratory bird habitat is quite diverse and widespread across FNF.

- Neotropical migratory bird habitat is probably little affected by vegetation management on the forest and at the regional scale (see introduction), while there have been increases in the extent and connectivity of forested habitat.
- Potential effects are minimized through forest management standards associated with riparian habitat, old growth habitat, down woody material/snags, livestock grazing, and weeds.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
23. Number of Nest Management Plans completed for bald eagles and peregrine falcons.
24. Number of peregrine falcon nesting territories and annual productivity.
29. Fish Habitat; Water Temperature
30. Range; Forage Use

30a. Noxious Weeds

45. Change in Water Quality
46. Water Yield Change from Timber Harvest
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Other factors outside of the Forest Service's control (e.g. deforestation of tropical wintering grounds, global climate change, drought, subdivision and housing development, exotic and parasitic species) may have negative effects on these species, based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for Neotropical migratory birds. A sufficient amount of suitable habitat to support species' requirements will remain throughout FNF with little risk to viability or population losses.

WILDLIFE USING OLD GROWTH HABITATS

LRMP Amendment 21 designated 31 old growth associated species for the FNF. Several of these (bald eagle, black-backed woodpecker, Canada lynx, fisher, flammulated owl, and harlequin duck) are sensitive species and thus MIS, and are detailed elsewhere in this document. See Table 12a below for specific habitat relationships and Montana NHP rankings of the rest of the 31 old growth associated species, all of which are well-distributed in their specific habitats across the FNF, with the exception of the woodland caribou. Old growth habitat is quite diverse, well-distributed, and widespread across the FNF, and FNF Plan direction works strongly towards the conservation of species using old growth habitats. There appears to be little risk of population loss of old growth associated species due to forest management activities and the FNF is expected to maintain viable populations.

Prior to LRMP Amendment 21, the Forest Plan identified three species as MIS to represent those species groups most likely to be changed by Forest management activities. The marten was identified as representing the tree dependent group. The pileated woodpecker was identified as representing the old growth dependent group. The barred owl was identified as representing the riparian tree dependent group. The following text from the Record of Decision (pages 11 and 12; USDA-Forest Service 1999) explains why and how A21 altered the MIS list regarding old growth associated species:

> There are over 30 birds or mammals associated with old growth forests on the Flathead National Forest. The planning regulations suggest that I identify one or more of these species as MIS, where appropriate, because of special habitat needs, or because their population changes are believed to indicate the effects of management activities on other species of major biological communities. As described in the FEIS and project file (Project File, Exhibit J-14), a number of scientists have pointed out the problems and limitations of using vertebrate species as MIS to describe effects on a broader groups of species. The underlying assumption is that the indicator species provide a reliable assessment of habitat quality, and that if habitat is maintained for the indicator, conditions will be suitable for other species as well. However, the response of animals to their environment is not a simple relationship, and it is unlikely that one species could very precisely reflect the response of another species or group of species (Morrison and others 1992).
>
> As a result of these concerns over the ability of any individual species to represent the needs of all other old growth associated species, I have decided to alter the MIS list regarding old growth associated species in two ways.
>
> First, I have decided to replace the barred owl, marten and pileated woodpecker with specific management direction, including monitoring, for old growth and snag habitat and all associated vertebrate species. In my judgment these changes are appropriate because they will focus our management efforts on old growth communities. I believe that this is a more effective method of achieving the intent of the fish and wildlife provision of the planning regulations than to focus narrowly on two or three species that cannot reliably reflect the response of other species (See, FEIS pgs 108-109; Project File, Exhibit J-14).
>
> Second, it is my decision to add to the MIS list ten species that are classified by the Regional Forester as sensitive species. The sensitive species added to the MIS are: common loon, harlequin duck, flammulated owl, boreal owl, black-backed woodpecker, western big-eared bat, northern bog lemming, fisher, wolverine, and lynx. I have decided to identify these species as MIS because they are, by definition, species for which population viability is a concern. Unlike marten, pileated woodpecker and barred owl, the Regional Forester has concluded there is evidence of current or predicted downward trends in habitat capability for these sensitive species that may reduce their existing distribution or population. Therefore, in my judgment these species merit particular attention in the evaluation of effects of forest management activities. At least five of these species - harlequin duck, flammulated owl, boreal owl, black-backed woodpecker, fisher, and lynx - are associated with old growth

> habitats. In my judgment, based on the information presented in the FEIS, these species fulfill the criteria for old growth MIS at least as well as the three species I am removing from the list. Moreover, I believe it is appropriate to focus our limited resources on programmatic efforts to evaluate and monitor the effects of management actions on the habitat of those species for which population viability is a particular concern.

The boreal owl is a cavity nester that uses a range of mature forest types above 4200 feet elevation, including subalpine fir, spruce, lodgepole, mixed conifer, and Douglas-fir (Hayward 1994 and 1997). Because the majority of the FNF is above this elevation and can support these habitats, the existing situation for old growth and other late-seral forests and that for snag and downed wood habitat characterize habitat for this species. This small owl has a system of long distance dispersal that results in high genetic connectivity and minimal genetic structuring of its populations, regardless of the habitat matrix with which they are associated (Koopman et al. 2007).

Natural History

Old growth forests are typically distinguished by: (1) large trees for the species and site; (2) accumulations of large dead standing and fallen trees; (3) decay or breakage of tree tops, boles, or roots; (4) multiple canopy layers; (5) wide variation in tree size and spacing; and (6) canopy gaps and understory patchiness (Helms 1998). This extensive diversity provides habitat for many plant and animal species. Snags, downed logs, rotting wood, fungi, mosses, lichens, and green tree canopy are essential for innumerable species of wildlife and plants (Carey 1996). Open understories or patches of open canopy provide foraging opportunities for predatory species. Interior closed-canopy forest reduces snow depths; shelters plants and animals from sun, heat, cold, dryness, and wind; and provides protection from some predators, competitors, and parasites. Despite their lack of interior habitat characteristics, old growth habitats along openings and roads are much more useful to old growth associated species than are early or mid-seral/structural stages.

Across any given landscape, old forests tend to achieve old growth characteristics at varying time scales and with a range of characteristics. The FNF adopted the definitions of old growth developed by the Regional Old Growth Task Force and documented in Green et al. (1992 [2005 update]). These types are described in Appendix C of the LRMP Amendment 21 Final Environmental Impact Statement (USDA-FS 1999). The definitions are specific to forest type (dominant tree species) and habitat type group. Key attributes for identification of old growth forest are age, numbers and diameter of the old tree component within the stand, and the overall stand density. Minimum thresholds have been established for these attributes and provide measurable criteria for implementation of standards related to old growth forest stands. For example, the most common old growth forest type on the FNF requires at least 10 trees per acre that are at least 180 years in age and 21 inches d.b.h., with a minimum stand density of 80 square feet basal area.

In the context of old growth forest stands, "the inherent capability of the land is defined by our understanding of forest succession, natural disturbance, and the resulting variability in forest composition and patterns" (FNF LRMP Amendment 21 Record of Decision). The FNF includes a range of disturbance regimes, dominated by stand-replacing fire, but also including mixed-severity and low-severity fire, as well as numerous insects and diseases. The result is a dynamic mosaic of stand patches, structures and ages across the landscape. Species associated with old growth habitat evolved with this dynamic landscape.

Old growth forests comprise one landscape component where recent disturbance has been infrequent, or not substantially stand-altering, allowing development of more complex stand structures associated with old growth (see below and Green et al 1992). Stands exceeding average intervals for stand-replacement events often have a considerable amount of larger-diameter snag and downed wood habitat, as well as abundant fungi, mosses, and lichens.

In addition to the measurable criteria established by Green et al., there are associated forest structural conditions that provide key ecosystem characteristics for wildlife species (e.g., very large decayed trees, very large snags, and large fallen trees). Species associated with old growth habitat use these key ecosystem characteristics in a variety of ways, including nesting, roosting, denning, feeding, and shelter. For example, several small mammal, amphibian, and invertebrate species use accumulations of large down woody material, debris and duff on the forest floor for shelter (Carey 1996). Variation in live tree size and spacing in old growth habitat also provides canopy gaps and understory patchiness (Helms 1998). Patches of open canopy within or adjacent to old growth habitat provides foraging opportunities for some species. Birds that nest in very large snags prefer various tree species, minimum diameters, minimum snag heights, states, and types of snag decay (Thomas and others 1979). The minimum diameter and density of very large snags used for plan components in the no-action alternative came from a comprehensive publication on managed forests in the Blue Mountains of Oregon and Washington (Jack Ward Thomas, 1979)(USDA FS 1999, Forest Plan Amendment 21).

FNF LRMP Amendment 21 recognized concerns over the ability of any individual species to represent the needs of all other old growth species and amended the MIS list regarding old growth associated species in two ways:

1) It replaced the barred owl, marten, and pileated woodpecker with specific management direction for old growth and snag habitat and all associated species.
2) It added to the MIS list ten species that were classified as sensitive species by the Regional Forester. These species were identified as MIS because they were, by definition, species for which population viability was a concern (Amendment 21 pg. 12).

Amendment 21 also designated 31 old growth associated species, several of which (bald eagle, black-backed woodpecker, Canada lynx, fisher, flammulated owl, harlequin duck, and northern goshawk) are detailed elsewhere in this document. These species are listed in Table 12a, along with their associations with various habitat elements.

Table 12a. Habitat correlations of old growth associated wildlife species (based on Warren 1998, and LRMP Amendment 21 FEIS), response to various habitat elements, and their occurrence on the Flathead National Forest.

Species	Global & State Ranks, SWAP, & PIF (MTNHP Feb. 2017) *	Habitats on and near Flathead National Forest	Canopy	Edge	Larger Patches	Snag	Down Log	Occurrence
American Marten	G5, S4	Mixed mesic, lodgepole, spruce/fir forests	Closed	-	+	X	X	Known current
Bald Eagle (S)	G5, S4, SSS, PIF 2	Mixed mesic forests, near large lake or river	Open		+	X		Known current
Black-backed Woodpecker (S)	G5, S3, SOC, SGCN3, PIF 1	Lower Montane & Montane; post-fire or insect-epidemic forests	Open			X		Known current
Boreal Owl	G5, S3S4 PSOC, SGIN, PIF 3	Mixed mesic and spruce/fir forest mosaic	Closed			X	X	Known current
Brown Creeper	G5, S3, SOC, SGCN3, PIF 1	Mixed mesic, lodgepole, and spruce/fir forests	Closed	-		X		Known current
Canada Lynx (T)	G5, S3, SOC, SGCN3	Mixed mesic, lodgepole, and spruce/fir forests; gentle terrain		+	+	X	X	Known current
Chestnut-Backed Chickadee	G5, S4, PIF 3	Mixed mesic and spruce/fir forests, especially cedar-hemlock	Closed	-		X		Known current
Fisher (S)	G5, S3, SOC, SGCN3	Mixed mesic and lodgepole forests	Closed				X	Known current
Flammulated Owl (S, N)	G4, S3B, SOC, SGCN3, PIF 1	Lower Montane and Montane, single-story.	Open			X		Known current
Golden-crowned Kinglet	G5, S5, PIF 3	Mixed mesic, lodgepole, & spruce/fir forests	Closed		+	X		Known current
Hairy Woodpecker	G5, S5	Mixed mesic, lodgepole, & spruce/fir forests	Open			X	X	Known current
Hammond's Flycatcher (N)	G5, S4B, PIF 2	Mixed mesic and spruce/fir forests	Open					Known current
Harlequin Duck (S)	G4, S2B, SOC, SGCN2, PIF 1	Swift mountain streams, riparian old growth (weak association)	Open				X	Known current
Hermit Thrush (N)	G5, S5B	Dry mixed mesic and spruce/fir forests	Open		+			Known current
Lewis' Woodpecker	G4, S2B, SOC, SGCN2, PIF 2	Lower Montane ponderosa pine and old burns	Open			X		Known current
Northern Goshawk	G5, S3, SOCSGCN3, PIF 2	Single or multistory old growth; clear forest floor	Closed		+	X		Known current
Northern Flying Squirrel	G5, S4	Mixed mesic &lodgepole forests			+	X	X	Known current
Pacific [Winter] Wren	G5, S3, SOC, SGCN3, PIF 2	Mixed mesic and spruce/fir forests, especially cedar-hemlock		-	+	X		Known current
Pileated Woodpecker	G5, S3, SOC, SGCN3, PIF 2	Mixed mesic forests	Closed		+	X	X	Known current
Pine Grosbeak	G5, S5	Mixed mesic, lodgepole, &spruce/fir forests						Known current
Pygmy Nuthatch	G5, S4	Large single-story ponderosa pine and mixed mesic forests	Open			X		Known current
Red-Breasted Nuthatch	G5, S5	Mixed mesic, lodgepole, and spruce/fir; relatively dry	Open		+	X		Known current
Silver-haired Bat	G3G4, S4, PSOC	Mixed mesic and lodgepole forests; caves and snags				X		Known current
Southern Red-backed Vole	G5, S4	Mixed mesic, lodgepole, and spruce-fir forest				X	X	Known current
Swainson's Thrush (N)	G5, S5B	Mixed mesic and lodgepole forest with shrub understory			+			Known current
Tailed Frog	G4, S4	Cold, high gradient headwater streams					X	Known current

Species	Global & State Ranks, SWAP, & PIF (MTNHP Feb. 2017) *	Habitats on and near Flathead National Forest	Canopy	Edge	Larger Patches	Snag	Down Log	Occurrence
Three-toed Woodpecker	G5, S4, PIF 2	Mixed mesic, lodgepole, and spruce/fir forests; post-fire				X		Known current
Townsend's Warbler (N)	G5, S5B, PIF 3	Mixed mesic and lodgepole forest; dense understory	Closed	-	+			Known current
Varied Thrush	G5, S5B SOC, SGCN3, PIF 3	Mixed mesic and spruce/fir forests, especially cedar-hemlock	Closed		+			Known current
Vaux's Swift (N)	G5, S4B, PIF 2	Mixed mesic and spruce/fir forests; large hollow snags				X		Known current
White-breasted Nuthatch	G4, S4	Large single-story ponderosa pine	Open			X		Known current
Woodland Caribou	G5T4, SX	Mixed mesic, lodgepole, &spruce/fir forests	Closed		+		X	Not expected

*T = Threatened; S = Sensitive Species; N = Neotropical migrant; X = important habitat component; + = positive correlation (where known); - = negative correlation (where known).

Natural Heritage Program Rank: G = species range-wide (global); S = state wide (or Western Montana if it differs across state); 1 = At high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state. 2 = At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state. 3 = Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas. 4 = Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. 5 = Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range. B = State rank modifier indicating breeding for a migratory species. T = Denotes rank for a subspecific taxon; appended to the global rank for a full species. X = Presumed to be extinct or extirpated from Montana; historical records only. SOC = Montana Species of Concern. PSOC = Montana Potential Species of Concern. SSS = Special Status Species.

FWP State Wildlife Action Plan (SWAP) status, where SGCN means Species of Greatest Conservation Need and SGIN means Species of Greatest Inventory Need (followed by state conservation status rank).

Partners In Flight (PIF) score (http://www.rmbo.org/pubs/downloads/Handbook2005.pdf)

Population, Habitat, and Distribution

Field inventories are necessary to accurately determine amount of old growth forests, because of the specific forest conditions required to qualify as old growth. Associated characteristics that influence the quality of the old growth, such as snags and downed wood, also require field inventory to adequately assess. It is infeasible to maintain an inventory that covers every acre within a large analysis area, such as a national forest, for purposes of determining the amount and location of old growth. This type of inventory more appropriately occurs at the project level, where site specific analysis and accurate identification of old growth may be necessary to conduct the proposed management actions. Some of the old growth on the Forest has been mapped during project level analysis, but the vast majority has not.

In the FEIS for Amendment 21 (USDA-FS 1999), it was estimated that the current amount of old growth forest on the FNF was about 15% overall. These values are below the mean Historical Range of Variability (HRV), as estimated from a variety of sources in A-21. HRV is an estimate of the range of conditions that occurred under native succession and disturbance regimes. The HRV was highly variable in both time and space across the FNF. The reduction in the amount of old growth is a trend that has occurred broadly across the Columbia River Basin, raising concerns about the viability of species associated with these habitats (Quigley et al. 1996).

To estimate the amount of old growth on the FNF in accordance with LRMP Monitoring Item #69, analysis was done using the Forest Inventory and Analysis (FIA) Summary Database. FIA data were used for a broad-scale analysis and to cover areas of wilderness. All forested FIA plots that were located on the FNF were used to estimate the proportion of old growth. The Green et al. 1992 definitions were used for this process. Those FIA plots in which wildfire or harvest have occurred since the 1993 to 1994 inventory (through 2003) were coded to not meet the old growth definition. This results in a conservative estimate of old growth as not all wildfire and harvest activities remove all old growth on the landscape, and some disturbances retain characteristics of old growth habitat. The published estimates of old growth for the FNF and by 5th code HUCs as of 2003 are shown in Table 12b. Table 12a, above, provides the occurrence of species associated with these old growth habitats.

Table 12b. Indicates estimates of proportion of old growth and associated 90% confidence interval for percent old growth by 5th code HUC through 2003 (Bush and Leach 2004).
[Note: Data for 5th code HUCS with fewer than 10 plots should not be viewed as adequate for a statistical sample or to provide confidence intervals. These are shown in italics].

5th code HUC	# of Plots	% of Plots	Lower Bound	Point Estimate	Upper Bound
1701020601	14	3.66	2.20	14.29	28.57
1701020602	*9*	*2.36*	*0.00*	*15.8*	*33.33*
1701020603	15	3.93	0.00	0.95	3.57
1701020604	*9*	*2.36*	*0.00*	*1.59*	*6.12*
1701020701	18	4.71	0.00	5.40	11.61
1701020702	22	5.76	0.71	6.49	13.61
1701020703	*4*	*1.05*	*0.00*	*0.00*	*0.00*
1701020704	*1*	*0.26*	*0.00*	*0.00*	*0.00*
1701020801	12	3.14	4.76	14.29	25.00
1701020802	*6*	*1.57*	*0.00*	*4.76*	*14.29*
1701020803	*1*	*0.26*	*0.00*	*0.00*	*0.00*
1701020804	*3*	*0.79*	*0.00*	*9.52*	*28.57*
1701020901	19	4.97	2.60	9.02	16.77
1701020902	23	6.02	6.19	15.16	25.40
1701020903	23	6.02	22.95	34.91	47.46
1701020904	19	4.97	7.30	16.69	27.11
1701020905	20	5.24	12.34	24.43	37.82
1701020906	20	5.24	0.84	6.07	12.50
1701020907	14	3.66	0.00	10.20	22.45
1701020908	14	3.66	0.00	2.45	6.98
1701021001	*2*	*0.52*	*0.00*	*42.86*	*100.00*
1701021002	*9*	*2.36*	*0.00*	*4.76*	*11.43*
1701021003	16	4.19	3.40	9.82	17.46
1701021004	*2*	*0.52*	*0.00*	*14.29*	*42.86*
1701021005	*3*	*0.79*	*0.00*	*14.29*	*35.71*
1701021101	11	2.88	0.00	9.09	20.00
1701021102	11	2.88	3.57	12.99	24.18
1701021103	12	3.14	0.00	2.38	6.72
1701021104	*6*	*1.57*	*0.00*	*5.71*	*16.07*

Forest Inventory and Analysis (FIA) data were used for a broad-scale analysis and to cover areas of wilderness. All forested FIA plots that were located on the FNF were used to estimate the proportion of old growth. The Green et al. (1992) definitions were used for this process. Those FIA plots in which wildfire or harvest have occurred since the 1993 to 1994 inventory were coded to not meet the old growth definition. This results in a conservative estimate of old growth, as not all wildfire and harvest activities remove all old growth on the landscape, some disturbances retain characteristics of old growth habitat, and on-the-ground verification establishes presence of associated habitat values. Table 12a, above, provides the occurrence of species associated with these old growth habitats.

From a broad Regional review Table 12c shows FIA data run in May 2007 (USDA-FS. 2007). Although criteria for old growth vary by vegetation types, about 13.7% (confidence interval range of 12.9 – 14.4) of national forests in Region 1 are estimated to have old growth habitat conditions.

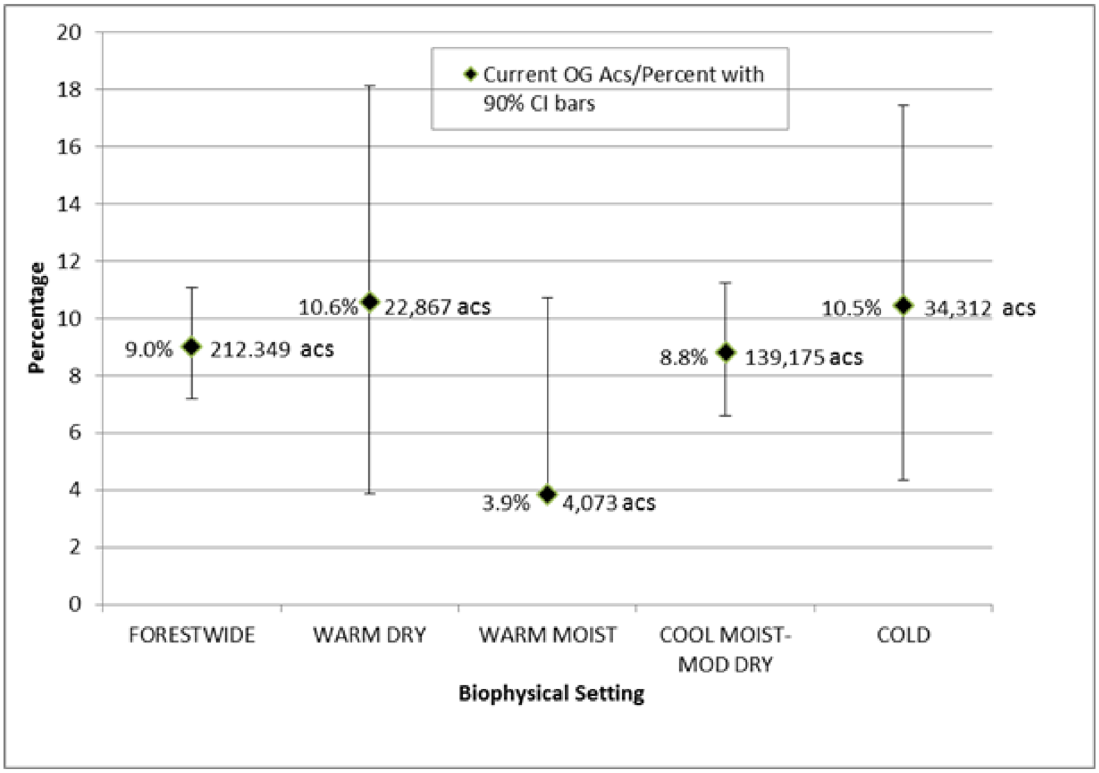
Table 12c. Percent old-growth strata on national forests in Region 1 through 2007.

Unit	Percent Old Growth Estimate	90%- Confidence Interval - Lower Bound	90%-Confidence Interval - Upper Bound	Total # PSUs	# Forested PSUs
Northern Region	13.7%	12.9%	14.4%	3883	3423
Beaverhead-Deerlodge	22.9%	20.5%	25.4%	547	442
Bitterroot	12.8%	10.1%	15.6%	252	226
Idaho Panhandle	11.8%	9.6%	14.0%	413	397
Clearwater	9.4%	7.3%	11.8%	305	300
Custer	10.1%	6.4%	14.1%	195	105
Flathead	11.0%	9.0%	13.1%	382	338
Gallatin	25.5%	21.7%	29.3%	285	223
Helena	10.9%	7.8%	14.1%	149	138
Kootenai	9.0%	7.2%	10.9%	370	352
Lewis & Clark	13.3%	10.6%	16.2%	299	267
Lolo	9.6%	7.7%	11.5%	347	327
Nez Perce	14.4%	11.8%	17.2%	339	308

An analysis of old growth forest on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007, monitoring item #69) found that the estimated percentage of old growth on all forested lands on the FNF is 11.6% with a 90% confidence interval of 9.6-13.8%, based on the regional FIA summary database (USDA-FS 2010). This old growth estimate included updates by removing all FIA plots within fire perimeters since 2003 to yield a more current conservative forest estimate. This estimate was re-affirmed in the 2008-2010 FNF monitoring report (USDA-FS 2010). An analysis of vegetation composition, structure, and landscape pattern on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007, monitoring item #68) reported on changes in vegetation since the time of the Amendment 21 analysis in 1999 (USDA-FS 2010). During this period, approximately 0.9% of the FNF was changed from a mid or late seral condition to an early seral condition due to regeneration harvest and 0.8% of FNF had undergone fuels treatment. The 2008-2010 FNF monitoring report added that fire has caused sizeable changes on the landscape in the last decade, dwarfing the impacts due to forest management, particularly in the watershed of the North Fork of the Flathead River (USDA-FS 2010).

Figure 5 displays the summary of old growth acres on the Forest as derived from FIA inventory data for the FNF LRMP revision analysis (subplots that were affected by fire were removed from calculations)(USDA-FS 2016c). The data source was FIA data using R1 Summary database (Hybrid 2011) analysis tools. The "current proportion" is expressed as an estimated mean percent, with a lower and upper bound estimate provided at a 90% confidence interval.

Figure 5. Current estimated acres and percent of old growth forestwide and by biophysical setting, on NFS lands (USDA-FS 2016c).



The summary of old growth forest acres on the Forest as derived from FIA inventory data is about 9.0% of the total forest acres. Old growth forest totals about 3.9% of the warm-moist biophysical setting, 10.6% of the warm-dry, 8.8% of the cool-moist to moderately dry, and 10.5% of the cold biophysical setting (USDA-FS 2016c). A large amount of area (over 350,000 acres) has burned across FNF lands between approximately 2000 and 2015. These fires are the primary reason for the loss of approximately 2.9% of the old growth (approximately 57,400 acres) on FNF over that time period (USDA-FS 2016c). The current forest plan prohibits removal of old growth through harvesting and no old growth on FNF has been removed through harvest treatments for at least 15 years.

In addition to forests that meet measurable Green et al. (1992) criteria for old growth, very large trees (>=20 inches d.b.h.) are present in forest stands that do not meet all of the old growth criteria. These are generally the more fire tolerant species such as western larch, ponderosa pine and Douglas-fir. They are often present in stands with a smaller average size class, because the stand as a whole has burned and regenerated, but these very large fire-tolerant trees have survived. These very large trees can contribute to future old growth and are valuable for wildlife species whether they occur at low densities or high densities and whether they are live, dead (snags), or down woody material. Table 12d displays the current mean percentage of FNF lands with very large trees within all size classes in each biophysical setting (90% confidence interval). There is a larger percentage of FNF with these very large trees than there is in old growth forest or the very large size class (USDA-FS-2016c).

Table 12d. Very large tree subclass definitions and current estimated percent, forestwide and by biophysical settings (USDA-FS-2016c).

Biophysical setting	Very large tree subclass tree density criteria	Estimated percent of NFS lands
Forestwide	Incorporates the criteria specific to each biophysical setting	14.1 (11.9-16.5)
Warm Dry	At least 8 trees per acre greater than or equal to 20 in. d.b.h.	18.9 (11.6-27)
Warm Moist	At least 10 trees per acre greater than or equal to 20 in. d.b.h.	11.5 (2.5-22)
Cool Moist-Mod Dry	At least 10 trees per acre greater than or equal to 20 in. d.b.h.	14.5 (11.8-17.4)
Cold	At least 10 trees per acre greater than or equal to 15 in. d.b.h.	9.2 (4.0-15.2)

Other factors that influence the current amount and distribution of old growth are the long-lasting effects of large wildfire in the late 1890s and early 1900s, and harvest activities over the past 65 years. In addition, old growth that may have existed on non-national forest lands within the planning area has largely been removed over the past 100 years or so through harvest or conversion of lands to other uses, such as agriculture. The average size of remaining old growth patches on all land ownerships are likely less than they were in the more recent past, particularly in areas where large patches were fragmented by harvest or development patterns. On the other hand, natural succession has likely resulted in the transition of other stands into old growth conditions.

Old growth conditions vary depending on the site capabilities (e.g., biophysical setting) and on other factors unique to the site, such as disturbance history. Description of typical old growth conditions are found in the aforementioned regional old growth publication (Green et al. 1992 [2005 update]). Descriptions of typical species compositions and forest structure in existing old growth on FNF by biophysical setting are provided in the Draft EID for FNF LRMP revision (USDS-FS 2016c).

Existing old growth on the Forest is vulnerable to loss due to moderate or high severity fire, as well as impacts from insects and disease. Fire exclusion and suppression, particularly in the lower elevation warmer sites, have altered vegetation structure and composition in some of the remaining old growth forests on the Forest. In the absence of fire, insects and diseases are responsible for about 75% of changes in vegetation trends (Byler and Hagle 2000). Increasing tree densities, canopy layers, and proportions of Douglas-fir in many areas have increased tree stress and vulnerability to mortality from insects, pathogens, and high intensity crown fires.

<u>Threats</u>

The primary threats to species using old growth habitats are habitat loss and fragmentation from timber harvest and stand-replacing fire. Past management actions, particularly timber harvest and fire suppression, have altered stand structure, particularly in areas that historically had low and moderate severity fire regimes.

Many types of disturbances, such as timber harvest, road construction, blowdown, fire, or insect or disease outbreaks, can affect old growth habitat and old growth associated species. This is well illustrated by the pileated woodpecker, a “keystone” species that provides second-hand nesting structures for numerous old growth species such as boreal owls, kestrels, and flying squirrels (McClelland and McClelland 1999). A disturbance can reduce living tree canopy cover to levels below that needed by the pileated woodpecker's main food source, carpenter ants, forcing the pileated to forage and possibly nest elsewhere. Carpenter ants, which live mostly in standing and downed dead wood, can drastically reduce populations of species such as spruce budworm (Torgersen 1996), the most widely distributed and destructive defoliator of coniferous forests in Western North America.

Some effects are seen most clearly at the stand level and may benefit or adversely affect old growth species. For example, opening the understory can have negative short-term effects on many old growth dependent species such as the pileated woodpecker, red-backed vole, or golden-crowned kinglet. Conversely, the resultant open-canopy forests tend to favor species such as the flammulated owl, Hammond's flycatcher, and various nuthatches. Opening the tree canopy can also result in new regeneration of shade-intolerant tree species such as western larch, which is most commonly used for nesting by the pileated woodpecker in this area.

Reducing downed wood and snags can remove habitat features that are essential or very important to many species, particularly marten and fisher (Witmer et al. 1998). Retaining the bulk of the largest material apparently decreases these effects, especially if distributed irregularly (Bull and Blumton 1999). Conversely, high amounts of downed woody material can slow or prevent regeneration of trees. In addition, accumulations of smaller logs and branches can substantially increase the probability of intense fire, which can remove all or most of the large living trees, snags, and other elements that define old growth.

Harvest or burning in stands immediately adjacent to old growth mostly has negative effects on old growth, but may have some positive effects. Harvesting or burning adjacent to old growth can remove the edge buffer, reducing the effective size of old growth stands by altering interior habitats (Russell and Jones 2001). Weather-related effects have been found to penetrate over 165 feet into a stand; the invasion of exotic plants and penetration by predators and nest parasites may extend 1500 feet or more (Lidicker and Koenig 1996). On the other hand, adjacent management can accelerate regeneration and sometimes increase the diversity of future buffering canopy.

The occurrence of roads can cause substantial edge effects on forested stands; sometimes more than the harvest areas they access (Reed et al. 1996; Wisdom and Bate 2008). Roads that are open to the public expose many important wildlife habitat features in old growth and other forested stands to loss through firewood gathering and increased fire risk.

Effects of disturbance also vary at the landscape level. Conversion from one stand condition to another can be detrimental to some old growth associated species if amounts of their preferred habitat are at or near threshold levels or dominated by linear patch shapes and limited interconnectedness (Keller and Anderson 1992). Reducing the block sizes of many later-seral/structural stage patches can further fragment existing and future old growth habitat (Richards et al. 2002). Depending on landscape position and extent, harvest or fire can remove forested cover that provides habitat linkages that appear to be "key components in metapopulation function" for numerous species (Lidicker and Koenig 1996, Witmer et al. 1998). Harvest or underburning of some late and mid seral/structural stage stands could accelerate the eventual creation of old growth in some areas (Camp, et al. 1996). The benefit of this approach depends on the degree of risk from natural disturbances if left untreated.

Samson (2006) in a regional review of habitat conditions for six species found that the northern goshawk, black-backed woodpecker, flammulated owl, pileated woodpecker, marten, and fisher: 1) are secure in terms of persistence, 2) no indication exists that forested ecosystems in the Northern Region have reached the 20 to 30% threshold of historic. Forested systems in the Northern Region are more extensive than in historic times (~1800) (Hessburg and Agee 2003, Gallant et al. 2004, Hessburg et al. 2005), and 3) comparison of habitat required for a species-specific minimum viable population to that available indicates well-distributed habitat far excess to that needed, given the natural distribution of species and their habitats as mapped by the Montana Natural Heritage Program, Idaho Birdnet, and the scientific literature.

However potential habitat for the marten and fisher is plentiful throughout Region 1 but it is not possible to model resting or natal area requirements (Samson 2006). Specific project evaluation needs to consider coarse woody material as well as vegetation types. Gaps in knowledge exist for some forest carnivores such as the marten which constrain the Forest Service's ability to design reliable conservation strategies. However, forest carnivore management considerations include an ecosystem level approach, reduction of fragmentation of late-successional forest with less clearcutting, retention of large physical structures commonly associated with late successional forest stands that are important components for denning and foraging, and riparian conservation area management (Ruggiero et al. 1994).

Bollenbacher and Hahn (2008) synthesized available information on the management of old growth (OG) forests, providing considerations for the OG forests at the project level, as motivated by two persistent questions: 1) Can forest management practices create, maintain, and restore resilient OG stands?, and 2) How do forest management practices aimed at increasing resiliency in OG and mature stands affect wildlife species associated with this ecosystem? Their conclusions are below:

> To date, only three studies have investigated wildlife response to harvest prescriptions designed to maintain OG forests. In a short-term, small-scale study conducted in northeastern Oregon, Bull et al. (1995) examined the use of an OG mixed-conifer stand by two species often associated with older forests, Vaux's swifts and pileated woodpeckers. Both species continued to use the stand for nesting and roosting after harvest of small-diameter dead and dying trees, though nest-parasitic Brown-headed cowbirds were more than twice as common in the treated stand as in an adjacent unlogged, control stand. The

second study compared small mammal and bird abundance in partial-retention stands (40% and 70%) to clearcut and uncut stands in interior British Columbia. Both of the partial-retention harvests provided habitat for small mammals and birds typical of mature forests, but the lighter retention stands began to show a shift towards species typically found in clearcuts (Steventon et al. 1998). Another project in British Columbia examined the effects of partial timber retention (40% and 70%) on cavity-nesting bird species associated with structural and functional attributes of OG stands. Four years after the treatments, there were no significant differences in the density of active cavity nests, avian species richness, or the selection of foraging trees between the two retention levels and the OG control stands (Quesnel and Steeger 2002, Steeger and Quesnel 2003). Combined, these preliminary results suggest little effect on wildlife populations, but caution is warranted because of the limited evidence focused on abundance metrics rather than measures of reproduction and survival, and the short temporal and small spatial scales of these studies.

Both drought and wildfire have historically been stressors, but their magnitude and duration are anticipated to increase by the 2040s based upon modelled climate changes (USDA-FS 2016c). Drought may also lead to an increase in insects and/or disease. Response to anticipated changes in climate will vary by tree species and structure, so response by associated wildlife species also varies. The most important tree species for a variety of wildlife species associated with old growth habitats on the Forest are western larch, ponderosa pine, and black cottonwood, because these species are key for primary cavity excavators that make nesting and denning cavities required by many other wildlife species. Large Douglas-fir provide important feeding habitat and also provide cavity nesting and denning habitat for a variety of wildlife species, but snags do not persist as long as western larch or ponderosa pine.

Conservation

The Forest Plan now includes goals, objectives, and standards to maintain, restore, and recruit old growth forests, to an amount and distribution that is within HRV (Table 12e). In addition to maintaining existing old growth, LRMP objectives and standards (added by LRMP Amendment 21) for retention of large snags, coarse woody debris, and restoration of fire as an ecological process are expected to benefit these species. In addition, Forest Plan direction to retain forest structure in the matrix surrounding old growth is likely to be more effective than corridors in providing habitat connectivity for these species.

Table 12e. Forest-wide goals, objectives, and standards relevant to old growth habitat.

Flathead National Forest's Forest-wide Goals, Objectives, and Standards that are Relevant to Old Growth Habitat
B. RESOURCE MANAGEMENT--GOALS
9. Ensure that Forest Service actions do not contribute to the loss of viability of native species.
10. Maintain and recruit old growth forests to an amount and distribution that is within the 75% range around the median of the historical range of variability. Where current conditions are below this amount, actively manage to recruit additional old growth.
11. Improve local knowledge of native succession and disturbance regimes, and resulting landscape dynamics. Apply this knowledge in developing desired future landscape patterns and ecological processes for individual landscapes and watersheds.
A. RESOURCE MANAGEMENT--OBJECTIVES

Flathead National Forest's Forest-wide Goals, Objectives, and Standards that are Relevant to Old Growth Habitat
4. WILDLIFE AND FISH f. Species Associated with Dead and Defective Tree Habitat - Maintain appropriate tree species composition, size, and density of dead and defective trees and down logs. See Vegetation Standard H(7).
g. Species Associated with Old Growth Forests - Maintain ecological processes and provide for natural patch size distribution. Manage landscape patterns to develop larger old growth patch sizes where needed to satisfy wildlife habitat requirements.
h. Forest Matrix - Provide sufficient retention of forest structure (large diameter live trees, snags, and coarse woody debris) to provide for wildlife movement through the matrix surrounding old growth forests.
6. VEGETATION c. Forest Composition and Structure - Manage landscapes to attain the 75% range around the median amount of old growth that occurred historically.
Landscape-level: (1) Maintain or actively restore landscape composition, structure and patterns to a condition similar to that expected under natural disturbance and succession regimes. Manage landscape patterns to develop larger old growth patch sizes where needed to satisfy wildlife habitat requirements.
(2) Prior to implementing vegetation management actions requiring an EA or EIS, analyze historical vegetation conditions to guide development of desired landscape conditions and to provide context for stand-level management.
(3) Restore the amount and distribution of old growth forests to within the historical range of variability. To accomplish this objective, recruit additional old growth from appropriate mid-seral stands.
(4) Manage landscape composition and patterns to reduce the risk of undesirable fire, insect and pathogen disturbances.
(5) Prescribe landscape treatments that protect old growth forests from disturbances that threaten old growth composition and structure. Treatments within existing old growth may be appropriate where current insect and disease conditions pose a major and immediate threat to other stands.
(6) Where fuel conditions and potential fire regimes have been significantly affected by fire exclusion and timber management, manage landscape fuel conditions (amounts and spatial arrangement) to restore the historical fire regime and reduce the risk of undesirable fire events. Emphasize this objective in areas where wildlands interface with urban and rural areas of private property.
(7) Protect or restore riparian vegetation to provide for shade, large woody debris, sediment filtration and normal hydrologic function, consistent with the site potential and natural disturbance processes.
Stand-level: **(1) Late Seral/Old Growth** (a) In all Potential Vegetation Groups (PVGs), protect existing old growth forests. Prescribe management actions within old growth when necessary to maintain or restore old growth forest conditions consistent with native disturbance and succession regimes. Vegetation treatments for these purposes will emphasize areas with historically low and moderate severity fire regimes. In addition, prescribe management actions within existing old growth where circumstances pose significant risks to sustaining old growth composition and structure.
(b) In **warm dry** PVGs, maintain or restore the historic proportion of shade intolerant species, such as ponderosa pine and western larch, and large multistory or single-story stand structures consistent with native succession and disturbance regimes. Reduce tree density and the proportion of shade tolerant species such as Douglas-fir in areas where fire exclusion has altered stand composition and structure. Increase the amount of area where under-burning can be used as a management tool.
(c) In **warm moist and cool moist** PVGs, maintain or restore large multistory or single-story conditions and shade intolerant species such as western larch, western white pine, ponderosa pine and Douglas-fir. Maintain large multistory stands dominated by western redcedar. Reduce tree density and the proportion of shade tolerant species such as grand fir and subalpine fir in areas where fire exclusion has altered stand composition and structure.
(d) In **cold moist** PVGs, maintain or restore historic large multistory structures and proportion of shade intolerant species such as western larch and Douglas-fir. Reduce tree density and the proportion of shade tolerant species such as subalpine fir in areas where fire exclusion has altered stand composition and structure.
(e) In **cold** PVGs, maintain or restore multistory and single-story old growth. Treatments that affect existing old growth should be limited to those necessary to promote regeneration of blister rust-resistant whitebark pine.
(f) In **riparian** PVGs, maintain existing old growth composition and structures.
(2) Mid Seral (a) Manage mid-seral stands to maintain the composition and structure expected under native succession and disturbance regimes. In all PVGs, maintain sufficient mid-seral stands to allow for recruitment of old growth within the historical range of variability. Emphasize old growth development in stands that are most likely to persist under native disturbance regimes, and that provide a patch size and pattern most advantageous to old growth associated wildlife species.

Flathead National Forest's Forest-wide Goals, Objectives, and Standards that are Relevant to Old Growth Habitat
(b) In **warm dry** PVGs, reduce tree density and increase the proportion of shade intolerant species, such as ponderosa pine and western larch, where needed to promote development of open, single-story structures. This may include regeneration harvests that maintain large, shade intolerant trees.
(c) In **warm moist, cool moist, and cold moist** PVGs, manage mixed-conifer stands to reduce tree density where needed, to increase the proportion of shade intolerant species, such as western larch, western white pine, Douglas-fir and ponderosa pine, and to promote development toward old growth. Manage mid-seral lodgepole pine dominated stands to reduce the risk of epidemic levels of mountain pine beetle and large-scale stand replacement fires, especially where wildlands interface with urban and rural areas.
(d) In **cold** PVGs, promote the regeneration of blister-rust resistant whitebark pine through the use of prescribed fire, mechanical treatments, and planting of rust-resistant seedlings in currently roaded areas.
(e) In **riparian** PVGs, encourage development of forest structures that will provide for coarse woody debris recruitment and other riparian functions. Manage for desired stand density and promote development of old growth structures. Increase the proportion of Englemann spruce, western redcedar, western larch, western white pine, and Douglas-fir; and maintain large cottonwood, birch, and aspen in areas to which they are adapted. Where consistent with other riparian management objectives and standards, implement management actions such as prescribed fire and thinning to achieve these objectives.
(3) Early Seral (a) Manage early seral stands in a manner that promotes development of stand composition and structure that is characteristic of the biophysical setting. Design treatments to encourage development of diverse herbaceous and shrubby vegetation native to the site. Thinning treatments should retain the tree species that are best adapted to the succession and disturbance regimes of the site.
(b) In the **warm/dry** PVG, encourage the establishment and development of ponderosa pine and western larch.
(c) In the **warm moist, cool moist and cold moist** PVGs, encourage the establishment and development of blister-rust resistant western white pine and western larch where these species are adapted.
(d) In the **cold** PVG, encourage the establishment and development of blister-rust resistant whitebark pine and alpine larch.
(e) In **riparian** PVGs, encourage development of riparian forest structures that will provide for coarse woody debris recruitment and other riparian functions. Encourage cottonwood, birch, aspen, western redcedar, and western larch as stand components in areas to which these species are best adapted. Where consistent with watershed, fisheries and other riparian objectives and standards, implement management activities to achieve this objective through actions such as planting, thinning, and prescribed fire.
D. ADDITIONAL DATA REQUIREMENTS AND ACCOMPLISHMENT SCHEDULE--OBJECTIVES
Continue old growth survey to fill in data gaps and to verify conditions within candidate old growth stands.
Conduct Forest-wide analysis of reference conditions and trends in landscape patterns.
Assess current and reference conditions to define landscape patterns including patch size, distribution, and connectivity at the watershed scale.
In the event of unanticipated disturbance events, such as wildfire, windstorm or bark beetle epidemic, conduct a post-disturbance assessment prior to salvage harvest of stands that were formerly in Large Multistory and Medium Multistory structure. Evaluate the likely effects of treatment, including no action, in order to ascertain potential future hazard and risk to adjacent stands, as well as the legacy value of large trees, snags and coarse woody debris to fire-associated wildlife species and future stand structure.
F. WILDLIFE AND FISH--STANDARDS
4. OLD GROWTH AND CAVITY-DEPENDENT WILDLIFE - Protect old growth forest consistent with vegetation standard H(6). Modify treatments as needed to meet habitat needs of old growth associated species. Moderate the timing, extent and intensity of vegetation treatments where needed to satisfy wildlife habitat requirements, limit associated human disturbance, or reduce excessive mortality risk. Maintain dead and defective trees and down logs as described in the Standards, Section H.
H. VEGETATION--STANDARDS
6. Maintain or restore existing old growth consistent with Wildlife and Fish objectives and standards.
(a) Vegetation management within old growth shall be limited to: (1) Actions necessary to maintain or restore old growth composition and structure consistent with native succession and disturbance regimes; or (2) Actions necessary to reduce risks to sustaining old growth composition and structure.
(b) Vegetation management within old growth shall to the extent feasible retain old growth composition and structure consistent with native disturbance and succession regimes.
(c) This standard does not apply to: personal-use firewood permits; tree removal to protect health and safety in administrative and recreational special use areas; tree removal necessary for trail or trailhead construction; or legally required private land access.

Flathead National Forest's Forest-wide Goals, Objectives, and Standards that are Relevant to Old Growth Habitat
(d) Road construction associated with vegetation management actions shall avoid or minimize impacts to old growth to the extent feasible.
7. In timber harvest areas other than personal-use firewood permits, tree removal to protect health and safety, or vegetation manipulation within developed recreation sites or designated special-use areas, retain sufficient vegetation structure, including large diameter trees. Consistent with native disturbance and succession regimes, provide for long-term snag and coarse woody debris recruitment; essential soil processes, including nutrient cycling and mycorrhizal functions; species habitat, including feeding and dispersal habitat for small mammals and birds; and long-term structural diversity of forest stands. In the absence of a site specific prescription to achieve this standard, the following apply: a. Maintain a density of snags to at least the following levels in areas ≥ 200 feet from open roads. Provide 5 live replacement trees (≥12" DBH) for each large-diameter snag (>20" DBH). If existing snag densities are below the following densities, substitute live trees where possible, and document why conditions cannot be met: <u>Dry PVG</u>: 2 snags average per acre 12 to 20 inches DBH and 1 snag average per acre ≥ 20 inches DBH <u>Moist PVG</u>: 6 snags average per acre 12 to 20 inches DBH and 2 snags average per acre ≥ 20 inches DBH <u>Cold PVG</u>: 6 snags average per acre 12 to 20 inches DBH and 1 snag average per acre ≥ 20 inches DBH
b. Retain coarse woody debris (woody pieces > 6 feet in length) in treatment areas at densities shown below. <u>Dry PVG:</u> 15 pieces average per acre 9 to 20 inches diameter and 10 pieces average per acre ≥ 20 inches diameter <u>Moist PVG:</u> 32 pieces average per acre 9 to 20 inches diameter and 15 pieces average per acre ≥ 20 inches diameter <u>Cold PVG:</u> 30 pieces average per acre 9 to 20 inches diameter and 15 pieces average per acre ≥ 20 inches diameter

Vegetation management actions may be appropriate within existing old growth, when necessary to maintain or restore conditions that are consistent with native succession and disturbance regimes. In warm dry Potential Vegetation Groups (PVGs), for example, this would allow for reduction in tree density and the proportion of shade-tolerant tree species [A PVG is a broad grouping of habitat types that are similar in temperature and moisture regimes.] The forest-wide standard requires that these actions be limited to those necessary to maintain old growth composition and structure consistent with native succession and disturbance regimes, or to reduce risks to sustaining old growth composition and structure. Overall, it is expected that such treatments would not reduce the total amount of old growth, but would shift the structure of some stands from closed to more open canopy structure.

Evaluation of Current Situation on NFS Lands

Summary for wildlife using old growth habitat:

- Old growth habitat is quite diverse, well-distributed, and widespread across the FNF.
- Other than edge effects, old growth habitat is probably little affected by vegetation management on FNF and in the region (see introduction), while there has been increases in the extent and connectivity of forested habitat.
- FNF Plan goals, objectives, and standards (Table 12e) work strongly towards the conservation of species using old growth habitats.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
20a. Furbearer trapping records from MFWP.
20b. Distribution of forest carnivores.
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.

70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

Factors outside of the Forest Service's control (many years of past fire suppression, drought, subdivision and housing development, etc.) may have negative effects on species using old growth habitats. Based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes according to the suitability and capability of NFS lands for wildlife using old growth habitats. A sufficient amount of suitable habitat to support species' requirements will remain throughout FNF with little risk to viability or to population losses.

WILDLIFE USING SNAG AND DOWNED WOOD HABITATS

Several wildlife species that use snag and downed wood habitats are Management Indicator Species on the FNF, and are detailed elsewhere in this document. These include bald eagle, black-backed woodpecker, Canada lynx, fisher, flammulated owl, Townsend's big-eared bat, and wolverine. Also see Table 13a below for specific habitat relationships and Montana NHP rankings of the additional species, all of which are well-distributed in their specific habitats across the FNF. There appears to be little risk of population loss of wildlife species associated with snags and downed wood habitats due to forest management activities and the FNF is expected to maintain viable populations.

Natural History

A wide variety of wildlife species are dependent on the existence of standing snags, "defective" live trees, and downed woody material. Snags are essential habitat for at least 42 species of birds and 10 species of mammals (Table 13a), all of which are known to occur on the Flathead National Forest. Large down logs are likely an important habitat component for many wildlife species in both aquatic and upland sites.

Table 13a. Flathead National Forest Wildlife Species that use snags, "defective" live trees, and/or downed logs.

Species	Global & State Ranks, PIF (MTNHP Feb 2017) *	Snag DBH (inches)	Snag Height (feet)	Downed logs?
American Kestrel (N)	G5, S5	17	20	
American Marten (former FNF MIS)	G5, S4	17	20	yes
Bald Eagle (S)	G5, S4, SSS, PIF 2	25	40	
Barred Owl (former FNF MIS)	G5, S4	25	30	
Barrow's Goldeneye	G5, S4 (PSOC), SGIN, PIF 2	25	10	
Big Brown Bat	G5, S4	17	20	
Black-backed Woodpecker (S)	G5, S3 (SOC), SGCN3, PIF 1	17	10	
Black-capped Chickadee	G5, S5	9	10	
Bobcat	G5, S5	-	-	yes
Boreal Chickadee	G5, S3 (SOC), SGCN3	9	10	
Boreal Owl (former S)	G5, S3S4 (PSOC), SGCN, PIF 3	17	10	
Brown Creeper	G5, S3 (SOC), SGCN3, PIF 1	15	20	
Bufflehead	G5, S5B	17	10	

Species	Global & State Ranks, PIF (MTNHP Feb 2017) *	Snag DBH (inches)	Snag Height (feet)	Downed logs?
Canada lynx (T)	G5, S3 (SOC), SGCN3	-	-	yes
Chestnut-backed Chickadee	G5, S4, PIF 3	9	10	
Common Goldeneye	G5, S5	25	10	
Common Merganser	G5, S5B	17	10	
Dark-eyed junco	G5, S5B	-	-	yes
Downy Woodpecker	G5, S5, PIF 3	11	10	
Fisher (S)	G5, S3 (SOC), SGCN3	25	30	yes
Flammulated Owl (S, N)	G4, S3B (SOC), SGCN3, PIF 1	17	10	
Great Horned Owl	G5, S5	25	30	
Hairy Woodpecker	G5, S5	17	20	
Harlequin Duck (S)	G4, S2B (SOC), SGNC2, PIF 1	-	-	yes
Hooded Merganser	G5, S4 (PSOC), SGIN, PIF 2	17	10	
House Finch	G5, S5	15	10	
House Sparrow	G5, SNA (Exotic species)	15	20	
House Wren (N)	G5, S5B	15	10	
Lewis' Woodpecker	G4, S2B (SOC), SGCN2, PIF 2	17	30	
Little Brown Myotis	G5, S4, SGCN3	17	10	
Long-eared Myotis	G5, S4	17	10	
Long-legged Myotis	G5, S4	17	10	
Long-tailed Weasel	G5, S5	-	-	yes
Mountain Bluebird	G5, S5B	15	10	
Mountain Chickadee	G5, S5	9	10	yes
Northern Alligator Lizard	G5, S3 (SOC), SGCN3, SCIN	-	-	yes
Northern Flicker	G5, S5	17	10	
Northern Flying Squirrel	G5, S4	17	20	
Northern Goshawk (former S)	G5, S3 (SOC), SGCN3, PIF 2	-	-	yes
Northern Hawk Owl	G5, S3 (SOC), SGCN3, SCIN	25	10	
Northern River Otter	G5, S4	-	-	yes
Northern Waterthrush (N)	G5, S5B	-	-	yes
Osprey	G5, S5B	17	40	
Painted Turtle	G5, S4	-	-	yes
Pileated Woodpecker (former FNF MIS)	G5, S3 (SOC), SGCN3, PIF 2	25	60	
Pygmy Nuthatch	G5, S4	17	30	
(Northern) Pygmy Owl	G4G5, S4	17	30	
Raccoon	G5, S5	25	10	
Red-breasted Nuthatch	G5, S5	17	20	
Red-naped Sapsucker (N)	G5, S4B, PIF 2	17	20	
(Northern) Rubber Boa	G5, S4	-	-	yes
(Northern) Saw-whet Owl	G5, S4	17	20	
Ruffed Grouse	G5, S4, PIF 2	-	-	yes
Silver-haired Bat	G3G4, S4 (PSOC)	17	20	
Southern Red-backed Vole	G5, S4	-	-	yes
Spruce Grouse	G5, S4	-	-	yes
Striped Skunk	G5, S5	-	-	yes
Swainson’s Thrush (N)	G5, S5B	-	-	yes
Tailed Frog	G5, S4	-	-	yes
Three-toed Woodpecker	G5, S4, PIF 2	17	20	
Tree Swallow (N)	G5, S5B	15	20	
Vaux's Swift (N)	G5, S4B, PIF 2	25	40	

Species	Global & State Ranks, PIF (MTNHP Feb 2017) *	Snag DBH (inches)	Snag Height (feet)	Downed logs?
Violet-Green Swallow	G5, S5B	15	20	
Western Bluebird	G5, S4B	15	10	
Western Jumping Mouse	G5, S4	-	-	yes
Western Screech Owl	G5, S3S4 (PSOC), SGIN, PIF 3	17	20	
Western (Townsend's) Big-eared Bat (S)	G4, S3 (SOC), SGCN3	?	?	
White-breasted Nuthatch	G5, S4	17	20	
Williamson's Sapsucker (N)	G5, S4B, PIF 2	17	20	
Wilson's Warbler (N)	G5, S5B	-	-	yes
Wolverine (S)	G4, S3 (SOC), SGCN3	-	-	yes
Wood Duck	G5, S5B	25	10	
Yuma Myotis	G5, S3S4 (PSOC), SGIN	17	10	

T=Threatened; S=Sensitive Species; N-Neotropical migratory bird; **Natural Heritage Program Rank**: G=species range-wide (global); S=state wide (or western Montana if different); 2=At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state. 3=Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas. 4=Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. 5=Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range. B=State rank modifier indicating breeding for a migratory species. SOC=Montana Species of Concern. PSOC=Montana Potential Species of Concern. **Partners In Flight** (PIF) score (http://www.rmbo.org/pubs/downloads/Handbook2005.pdf). FWP **State Wildlife Action Plan** (SWAP) status, where SGCN means Species of Greatest Conservation Need and SGIN means Species of Greatest Inventory Need (followed by state conservation status rank).

The number, species, size, and distribution of available snags strongly affect snag-dependent wildlife. An insufficient number of suitable snags may limit or eliminate populations of cavity-using species (Thomas et al. 1979, Saab and Dudley 1997). Because most cavity-using birds eat insects, they can substantially reduce tree mortality and damage caused by forest pest insects (Torgersen, Mason, and Campbell 1990, Torgersen 1996, Jackman 1975, Bull et al. 1997). Those that have the greatest potential for use by cavity nesters have old nesting cavities, broken tops, some limbs and bark, and some degree of decay (Bull 1987). The various species of cavity nesters all appear to use different microhabitats, and thus many species might not be provided for in homogenously managed stands (Hutto 1995b).

Downed trees and other woody material, such as stumps, bark, and limb piles, occur naturally on the forest floor and provide diversity in the environment. In addition, downed logs and stumps are required for resting and denning, are vital for hunting below the snow in winter (Buskirk and Ruggiero 1994), and are apparently also used as travel cover, particularly in lieu of vegetative cover by many of the species listed in Table 13a above. Several ant species that require large-diameter downed logs prey on defoliating insects such as western spruce budworm (Torgersen and Bull 1995). Larger-diameter downed trees are generally most important because they provide stable and persistent structures as well as better protection from weather extremes. A variety of sizes and decay classes are needed in downed wood "in order to conserve functional processes that foster sustainable forest ecosystems" (Torgersen and Bull 1995).

In the FNF, western larch and black cottonwood snags appear to receive the most use by wildlife, with lesser use of spruce, subalpine fir, and lodgepole pine. This may be related to the fact that these latter species live or dead, have less resistance to windthrow. Lodgepole pine trees are apparently avoided by some species, even if they were of large diameter (Torgersen and Bull 1995).

The character of snag and downed wood habitat varies dramatically over time and space, largely depending on recent disturbance history. Warmer and drier areas historically underwent more frequent, lower-intensity fires, and typically supported fewer snags and large downed logs than cooler and moister environments that often reached climax conditions before having stand-replacing fires. Exposure to heavy winds, shallow or deep water tables, susceptibility to insect and disease outbreaks, past vegetation management, and vulnerability to firewood cutting are also important variables.

Reducing downed wood and snags can remove habitat features that are essential or very important to many species, particularly marten and fisher (Witmer et al. 1998). Retaining the bulk of the largest material apparently decreases these effects, especially if distributed irregularly (Bull and Blumton 1999). Conversely, high amounts of downed woody material can slow or prevent regeneration of trees. In addition, accumulations of smaller logs and branches can substantially increase the probability of intense fire, which can remove all or most of the large living trees and snags.

Population, Habitat, and Distribution

Hillis, Pengeroth, and Leach (2003) assessed the status of snag habitat and snag-dependent species across Region 1. West of the continental divide, the analysis was designed to address the habitat needs of the pileated woodpecker, a species who's needs meet or exceed those of other cavity nesters with very few exceptions. They concluded that the distribution of mature/old forest (that provides snag nesting habitat for Pileated Woodpeckers and other cavity-dependent species) has not changed substantially since pre-fire-suppression/pre-logging periods. Habitat estimates for the Pileated Woodpecker based on the Regional nest tree habitat model showed that nest habitat is abundant and well-distributed across FNF and Region. Since 2003, numerous wildfires in the South Fork sub-basin and elsewhere on the FNF have created abundant, high quality snag habitat. Table 13b compares the status of snags at both FNF and Region 1 scales.

Table 13b. Levels of mature and old forest at FNF and Region 1 (west of continental divide) scales, relative to the historic range of variability (HRV).

	Flathead NF	Region 1 (West)
Acres of potential habitat	1,455,982	10,520,384 ac
Acres of existing habitat	720,062	5,128,766 ac
Existing ÷ potential	49.5%	48.8%
HRV	24.7 to 72.1%	24.7 to 72.1%

Table 13b suggests that there has been no substantial departure in snag densities from historic levels at either the Forest or Region 1 scale. Habitat estimates for the pileated woodpecker based on the Regional nest tree habitat model shows that nest site habitat is abundant and well distributed across the Northern Region (Samson 2005).

When the emphasis on managing old growth forests (USDA-FS 1999) is considered, and the large number, acreage, and distribution of recent fires on the FNF in 1988, 1994, 2000, 2001, and 2003 that recruited large numbers of snags, it can be concluded that at the FNF scale, snag habitat is being both recruited and retained (after natural events) at higher-than-normal levels. At the FNF scale, fires within the last 6 years within stands greater than 9 inches (trees large enough to provide a potentially suitable snag) occurred at 125.5% of the average historic conditions (Hillis, Pengeroth, and Leach 2003). Looking at just the North Fork Flathead 4th Code Hydrologic Unit, fires within the last 6 years within stands greater than 9 inches occurred at 230% of average historic conditions.

An analysis of live trees, snags and coarse woody debris retention on the FNF (Forest Plan Monitoring and Evaluation Report: Fiscal Years 2008-2010, monitoring item #70) reported on recent research on the FNF in 2008. This study (Wisdom and Bate 2008) looked at a stratified random sample of 49 stands and analyzed 10 variables that might be related to snag density. The study found that factors significantly affecting snag density included seral stage, timber harvest, proximity to open roads, distance to the nearest town, and whether the stand was uphill or downhill from the nearest road. Mean snag density for all species was found to be 19 times higher in unharvested stands compared to clearcut areas and 3 times higher than stands that had undergone partial harvest. The study did not address the range of natural variability. A Region 1 analysis of western Montana snag densities using the FIA summary database is currently being finalized. Data shows that 15 inch and larger snags occurred in wilderness on between 4 and 22% of plot clusters. Outside wilderness, the range is 4 to 16%, indicating that snag distribution is uneven across the landscape at any given point in time and leading to a broad range in confidence intervals when trying to interpret the natural range of variability. No significant difference between wilderness/roadless and areas outside is apparent in this coarse woody debris (CWD) data, as broad confidence intervals overlap. The majority of FNF lies within the subalpine habitat grouping, where measured woody debris totals ranged from less than 2 tons/acre to 271 tons/acre. Looking at the data for stands over time, FNF average CWD by age class hovers between 45 tons/acre and 60 tons/acre, without an obvious trend over time.

Threats

Timber harvest, insects, disease, fires, and firewood cutting directly affect the availability of snag and downed wood habitat. Harvest activities often create large accumulations of downed woody material. However, this is generally of smaller diameter, and much of it is cleared from the forest floor for fuel hazard reduction and future tree regeneration. Removal of intact, windfirm snags such as western larch and Douglas-fir, has greater impacts on wildlife species than removal of non-windfirm snags such as lodgepole pine. Stand-replacing wildland fires dramatically increase the availability of snag and downed wood habitat features unless they are consumed by reburn. Salvage of fire damaged trees does occur but generally the amount of current post fire salvage harvest is limited, and the current amount of habitat is surplus to what occurred historically. As an example since 1999, 15% of FNF has had some intensity of wildfire. Yet only 1.7% of the burned area has been salvaged, representing 0.2% of the total forest area that has had salvage after wildfire (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2007, monitoring item #68). The 2008-2010 FNF monitoring report added that fire has caused sizeable changes on the landscape in the last decade, dwarfing the impacts due to forest management, particularly in the watershed of the North Fork of the Flathead River (USDA-FS 2010).

Wisdom and Bate (2008) found a strong relationship between snag density and seral stage, timber harvest and human access in pine and larch forests. Snag density was highest in late-seral stands, 19 times higher in unharvested stands compared to a complete harvest, and stands without a road adjacent to them had 3 times the density of snags in contrast to stands along an open road. Wisdom and Bate (2008) found that snag density was 40% lower along transects within 164 feet of an adjacent road compared to those transects greater than 164 feet. Fewer snags are present even beyond 164 feet as firewood cutters are using cable systems to cut and move snags at longer distance from roads (Wisdom and Bate 2008, FNF employee observances). Snag density was substantially lower in unharvested stands adjacent to private or other non-NFS land versus unharvested stands surrounded by national forest. Wisdom and Bate (2008) assumed the facilitation of close-by private ownership accounted for snags harvested for either firewood or timber.

Conservation

FNF Plan goals, objectives, and standards work towards the conservation of species using dead wood habitats. For snags and down logs, the forest-wide standard is to retain sufficient structure, including large diameter live trees, in timber harvest areas to provide for long-term snag and coarse woody debris recruitment, essential soil processes, wildlife habitat, and long-term structural diversity of forest stands. In the absence of a site-specific prescription, minimum densities and diameters are specified for Dry, Moist, and Cold PVGs. The INFISH amendment provided additional direction for retention of coarse woody debris within RHCAs. Sufficient vegetation structure is to be retained, including large diameter trees, in timber harvest areas other than personal-use firewood permits.

Project planning must account for the discrepancy of snags along roads and adjacent private lands to mitigate snag loss in areas where snag standards are not met. Also, as described in Item 68 (Forest Plan Monitoring and Evaluation Report: Fiscal Years 1997-2008), fire is responsible for much larger scale change than management activity, and will be the greatest factor in determining future levels of snags and coarse woody debris. The 2008-2010 FNF monitoring report added that fire has caused sizeable changes on the landscape in the last decade, dwarfing the impacts due to forest management, particularly in the watershed of the North Fork of the Flathead River (USDA-FS 2010).

Amendment 21 (USDA-FS 1999) also provides direction for the management of old growth forests that contain large snags. Key elements of that direction include: 1) treatments within old growth forests are limited to those that “maintain or restore old growth composition and structure, consistent with native succession and disturbance regimes”; 2) “provide an amount (of old growth forest) that is within the 75% range around the median of the historical range of variability”; and 3) manage for natural patterns, processes, snags and coarse, woody debris.   Since old growth forests provide the best opportunities for snag recruitment, Amendment 21 suggests that there is excellent potential for long-term recruitment of snag habitat for snag-dependent species, and along wit wildfires, will be consistent with historic conditions at the Forest scale.

Evaluation of Current Situation on NFS Lands

Summary for wildlife using snag and down wood habitats:

- Snag and down wood habitats are quite diverse and widespread across FNF.
- FNF Plan goals, objectives, and standards (Table 12d, above) work strongly towards the conservation of species using snag and down wood habitats.
- Snag and down wood habitats are addressed during NEPA project planning based on site surveys and situations.

Relevant FNF Forest Plan Monitoring Items (USDA-FS 2010):

15. Occupancy of old growth forests by old growth-associated wildlife species.
19. Forest bird distribution, productivity, and survivorship monitoring stations.
20a. Furbearer trapping records from MFWP.
20b. Distribution of forest carnivores.
54. Open Road Density
68. Vegetation Composition, Structure, and Landscape Patterns
69. Proportion of old growth forest and patch sizes, by Subbasin and watershed.
70. Implementation and effectiveness of live tree, snag, and coarse woody debris retention in timber harvest treatment areas.

While 40 or more years of past fire suppression and factors outside of the Forest Service's control (drought, subdivision and housing development, etc.) may have negative effects on species using dead wood habitats, based on the above analysis management actions taken on the FNF will provide the habitat composition, structure and processes for wildlife using old growth habitats according to the suitability and capability of NFS lands. There appears to be little risk of population loss and species viability will be maintained.

TERRESTRIAL WILDLIFE and CLIMATE CHANGE

Beth Hahn, June 2009, updated by Steve Anderson and Reed Kuennen

(More recent information is provided above for individual species and habitats)

While climate is based upon historic information, climate change projections are the current state of knowledge, derived from a composite of different climate prediction and emission scenarios as interpreted and reported by the scientific body of the Intergovernmental Panel on Climate Change (IPCC). Effects of climate change have been examined at multiple scales; from global to national to regional and local. Different climate models project different rates of change in temperature and precipitation because they operate at different scales, have different climate sensitivities, and incorporate feedbacks differently. Climate science is rapidly changing and there are numerous climate models depicting a wide array of environmental factors, which are then "downscaled" to predict future scenarios at regional and local scales. The smaller the scale, the higher the level of uncertainty (IPCC 2007).

There are a large volume of publications and sources of information on the topic of climate change and they provided a useful synthesis of information pertinent to the ecosystems of the Flathead NF. These publications include: The Northern Rockies Climate Change Primer (USDA FS 2012); "Climate Change in the Northwest" (Dalton et al. 2013); "Effects of climatic Variability and Change on Forest Ecosystems" (USDA 2012); and "Vulnerability, Exposure, and Sensitivity in Restoring and Maintaining the Adaptive Capacity of forest landscapes in the Northern Region of the northern Rocky Mountains" (Bollenbacher et al., Review Draft May 2013). For more detailed information of topics discussed in this section, refer to the Forest Service Climate Change Resource Center website (www.fs.fed.us/ccrc).

Climate change and trends

Considerable natural variation in climate conditions has occurred historically, both over the long time frame (e.g., many centuries) and shorter time frame (e.g., the past 100 to 200 years). Climatic variation over periods of several thousand years is understandably difficult to determine. However, there is general consensus that a global-wide significant warming period occurred from about AD 950 to 1250 (the "Medieval Warm Period") followed by a period of cooling (the "Little Ice Age") that lasted until the latter half of the 19th century. Forest composition, structure and patterns on the Flathead NF were influenced by these earlier climatic conditions and changes, creating what might have been quite different vegetation conditions in the distant (or not so distant) past than what we see today. The expected long-term climate variations of the future are expected to continue to drive changes in forest conditions as they have done in the past. Variation in climate would also be expected to occur year-to-year or decade-to-decade around a long-term trend.

The climate models are unanimous in projecting increasing average annual temperatures over the coming decades in the Pacific Northwest during all seasons, regardless of uncertainties in modeling or emissions (Nakicenovic 2000). These increases exceed observed 20th century year-to-year variability, generally by the 2040s. Many climate models project increases in precipitation during the winter and decreases in summer; however, projections of precipitation are more variable among the models, and more comparable to 20th century variability. Beyond mid-21st century, climate change projections are less certain because they depend increasingly on greenhouse gas emission rates over the next few decades. As a result of changes in long-term average trends, some weather conditions and events we now consider to be extreme may occur more frequently or with greater magnitude, while others may occur less frequently (e.g., more unusually warm periods and fewer cold spells).

Potential impacts from these trends include iincreased:

- wildfire activity with more frequent, large fires
- insect and disease epidemics
- rain-on-snow events
- winter stream flows
- air temperature
- water temperature
- evapotranspiration

Analysis of satellilte measurements show slight increases in the total amount of annual water (a combination of snow, surface water, groundwater and soil moisture) for northwest Montana (Famiglietti and Rodell 2013), with initiation of snowmelt occuring about 2 weeks earlier, on average (see FNF Plan Revision Assessment, 2013, for more details).

Observed wildlife responses to climate change

In response to climate change and other stressors, terrestrial wildlife have three basic options (Rice and Emery 2003; Parmesan 2006). Species can respond in place, through genetic, physiological, or behavioral adaptations. Species can move or migrate to a new location, or species unable to successfully reproduce and survive face local extirpation or extinction.

Several comprehensive reviews and meta-analyses (Root et al. 2003; Parmesan and Yohe 2003; Parmesan 2006; Janetos et al. 2008) have concluded that the majority of terrestrial biota included in analyses showed changes consistent with expected population responses to a warming climate: distributional shifts in latitude and elevation (Parmesan et al. 2000; Root and Schneider 2002; Martinez-Meyer et al. 2004; Guralnick 2007; Brown 2008); advancing phenology (arrival earlier in spring which cause migration and nesting to get out of step with food supplies (Price and Glick 2002) and shift some species move to different ranges and may face new prey, predators, and competitors, as well as different habitats) is well-documented for many migratory birds and butterflies (Inouye et al. 2000; Root et al. 2003; Price and Root 2005; Parmesan 2006; Janetos et al. 2008); disease emergence and spread is a concern, though considerable uncertainty exists regarding the impacts of climate change on parasite and pathogen dynamics (Harvell et al. 2009; Lafferty 2009); and extirpation and extinction is known for a few taxa including several butterfly species (McLaughlin et al. 2002; Franco et al. 2006), and to local extirpations of pikas in the Great Basin (Beever et al. 2003).

Projected wildlife responses to climate change

Climate change is expected to restructure existing plant and wildlife communities though responses will be species-specific and highly variable (Parmesan 2006; Janetos et al. 2008). Most models predict that species habitat would move upward in elevation and northward in latitude, while habitat would be reduced at lower elevations and lower latitudes (USDA 2012). New climatic conditions may change faster in some locations than tree species can disperse, creating uncertainty about the future vegetation composition of these new habitats. The complex topography and associated diversity of site conditions on the Flathead NF makes prediction of vegetation and habitat shifts as a result of climate change even more complex and uncertain.

Although habitat and wildlife responses are expected to be complex, several patterns are projected. Highly mobile wildlife species with large geographic ranges and wide physiological tolerances will respond more favorably to a changing climate. Wildlife are expected to shift their ranges poleward and upward along elevational gradients (Inkley et al. 2004; Parmesan 2006), but range shifts may be hampered by habitat fragmentation, roads, and urbanization (Brown 2008). Thus, widespread, generalist or invasive species will benefit from rapidly changing environmental conditions (Dukes and Mooney 1999; Simberloff 2000; Chornesky et al. 2005; Joyce et al. 2008). In a warmer climate, invasive species are expected to become a larger problem in areas that are currently cooler (Joyce et al. 2008). In contrast, rare, narrowly distributed, and endemic species, or those animals with limited dispersal ability, are projected to decline (e.g., McDonald and Brown 1992).

Cold-limited species will likely expand their ranges, if suitable habitat exists. Among cold-limited wildlife, species with faster generation times (e.g., insects) will adapt more rapidly to changing conditions, which may also result in the range shift or expansion of arthropod-borne infectious diseases (Daszak et al. 2000; Harvell et al. 2002; see also Harvell et al. 2009; Lafferty 2009). In contrast, longer-lived, cold- or snow-dependent mammals such as wolverines (Magoun and Copeland 1998; Copeland et al. 2007), lynx (Gonzalez et al. 2007), pikas and snowshoe hares (Beever et al. 2003; GAO 2007) may be dramatically affected by a warming climate.

For the wolverine, for example, the primary threat is predicted loss of persistent spring snow breeding habitat due to climate change at elevations that remain well below freezing during the cold season, including the higher elevations in the western North American mountains (Stewart 2009)(Inman et al. 2011). However, there is a high level of uncertainty with respect to local changes in snow conditions at the national forest scale. Glaciers in Glacier National Park have been receding for several decades, but climate models for the northern Rockies show that precipitation may actually increase in winter in the future. The future timing of snowmelt is also uncertain; the onset of snowmelt has occurred about 2 weeks earlier over the last 50 years (IPCC 2007, PRISM historical climate data). A study in Glacier National Park, adjacent to the Flathead Nationa Forest, determined it is difficult to detect regional impacts of global climate change when decadal-scale climatic variations such as the Pacific Decadal Oscillation (PDO) have a strong influence on local processes (Pederson et al. 2004).

Wildlife populations will also be indirectly affected by the effects of climatic trends. Mammals inhabiting western public lands expected to experience noticeable effects of climate change include grizzly bears, bighorn sheep, pikas, mountain goats, and wolverines (GAO 2007). Some of these species are wide-ranging and have the ability to move in response to climate change effects, while others are less mobile and may be less adaptable. For example, movement patterns of deer, bighorn sheep, and elk may be affected temporally, as snowpack patterns shift (Janetos et al. 2008). Mountain goats, a species tied to open cliffs and rocky environments at high elevations, may be less able to move in response to climate change. Finally, the projected 60-90% loss of suitable bird habitat may decrease Neotropical migratory bird species richness by 30-57% (Price and Root 2005).

Risk or vulnerability assessments are a common method used to assess potential effects of climate change (Dalton et al. 2013). MTFWP Region 1 completed a climate change vulnerability assessment for terrestrial and aquatic species in 2013–2014. Their assessment used an “ensemble” climate prediction model to project future trends. This model used the median of 16 major global circulation models and “downscaled” predictions based on elevational relief, oceanic influence, and other factors. Based upon these projections, MTFWP produced a vulnerability index for each of the Montana Species of Concern (SOC) or species of greatest conservation need (SGCN), based upon NatureServe Guidelines (2011)(MTFWP 2013). The index uses a scoring system that integrates a species’ exposure to climate change with species-specific factors such as dispersal ability, natural and human-caused barriers, temperature/precipitation sensitivity, specificity of habitat, interactions among species, genetic factors, and documented response to climate change. Table 48 shows wildlife species occurring on Flathead NFS lands that are rated as being highly vulnerable (7) to extremely vulnerable (9) to climate change.

Table 1. Climate change vulnerability indices for MTFWP Region 1

Common Name	Scientific Name (S Rank)	Climate Vulnerability Index Score	Numerical Score
Northern Bog Lemming	*Synaptomys borealis* (S2, SOC)	Extremely Vulnerable	9
Canada lynx	*Lynx Canadensis* (S3, SOC)	Extremely Vulnerable	9
Wolverine	*Gulo gulo luscus* (S3, SOC)	Highly Vulnerable	7
White-tailed Ptarmigan	*Lagopus leucura* (S3, SOC)	Extremely Vulnerable	9

Common Name	Scientific Name (S Rank)	Climate Vulnerability Index Score	Numerical Score
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis* (S2B, SOC)	Highly Vulnerable	7

Note regarding table data: MTFWP used downscaled temperature prediction data from Climate Wizard, using the change in annual average temperature, emission scenario Medium A1B, and the ensemble average for the General Circulation Model. MTFWP obtained information on predicted change in moisture from NatureServe, using the Hamon AET: PET moisture metric data they provided. The assessments were completed under these climate scenarios only. MTFWP and partners involved did not assess nor give an opinion on these climate models. The species' vulnerability to climate change was estimated using only the models mentioned above. No other potential climate conditions were considered. Therefore, climate vulnerability of individual species likely will be different under different climate models.

While the Forest Service cannot control climate change, general measures, as well as some species-specific measures, have been identified to help reduce species vulnerability to climate change (Shoo et al. 2013). General measures include: 1) secure and restore "refugia" that are within the species current range, 2) secure and restore "refugia" that are outside the species current range, 3) secure and restore movement paths so that species can migrate and/or interbreed, 4) develop assisted colonization plans. The Flathead NF is within the current range of the species listed above. The FNF LRMP Revision (in progress) will include plan components to address these species and their habitats (see FNF LRMP Revision Assessment for ecosystem and species-specific discussions of existing conditions and trends). Refugia outside the current range of these species are not addressed in this document, nor is assisted colonization. The USFWS or MTFWP are responsible for developing and implementing assisted colonization plans if needed.

<u>Potential Adaptation Opportunities</u>

Wilsey and others (2013) provide an overview of the types of models available for forecasting the effects of climate change on key processes that affect wildlife habitat, as well as on individual species distributions and populations, These authors also discuss key limitations of available models and how such limitations should be managed. Management plans could incorporate several adaptation options into their decisions (Root and Schneider 2002 ; Inkley et al. 2004; Bilby et al. 2007; Janetos et al. 2008; Joyce et al. 2008):

Forestall ecosystem change:

- Adopt landscape management practices to enable species movements through large connected units, broader habitat corridors (north-south), and increased habitat continuity
- Prevent and control invasive species
- Use prescribed and wildfire to maintain and restore ecosystems

Manage for ecosystem change:

- Assist transitions, population adjustments, range shifts, other natural adaptations (e.g., assisted migration: Inkley et al. 2004; Hoegh-Guldberg et al. 2008)
- Employ population monitoring and adaptive management to explore directions of change and natural response at local scales
- Maintain or enlarge roadless areas, oriented north-south along elevational gradients; to minimize effects of habitat fragmentation and change
- Manage for resilient, diverse conditions by reducing other stressors, while at the same maintaining natural disturbance processes
- Manage for asynchrony; diverse vegetative conditions
- Promote connected landscapes to enable dispersal and migration, recolonization, and genetic exchange for genetically diverse populations

- Evaluate/reduce fragmentation, plan cumulative landscape treatments to encourage defined corridors as well as widespread habitat availability
- Land acquisition program can assure habitat connectivity, protect core habitat areas, and preserve or increase stored carbon.

Increasing connectivity between protected natural areas (public lands such as national forests) will be important to increase the probability of persistence for many species as climate changes (Krosby, et al. 2010). Land acquisition or policies to encourage private landowners to reduce barriers to species movement are needed to increase connectivity among protected public lands (Krosby, et al. 2010). Also, most opportunities for increased sequestration of greenhouse gases on forests and grasslands are on private lands. (USDA-FS 2008c). Private land stewardship, purchase or easements are increasingly important strategies, especially in the southern third of the Yellowstone to Yukon region (Graumlich and Francis 2010).

National Forests have a variety of management area lands that are considered “protected areas” under the International Union for Conservation of Nature (IUCN). The IUCN has developed six Protected Area Management Categories that define protected areas according to their management objectives which are internationally recognized. The categories provide international standards for defining protected areas and encourage conservation planning according to their management aims. The national forests, including the FNF, would be considered an IUCN protected area. National forest management areas as described through forest planning would fit some of the IUCN protected area categories which are listed in the order of the strongest protection: Ia Strict Nature Reserve; Ib Wilderness Area; II National Park; III Natural Monument or Feature; IV Habitat/Species Management Area; V Protected Landscape/Seascape and, VI Protected area with sustainable use of natural resources.

The FNF is a large wildland or protected area of over 2,400,000 acres. Corridors or connections allow passage of species between two or more wildland areas. FNF lands will remain in public ownership and management into the future. Ruggiero, et al. (1994a) and Noss (2007) among others have discussed general conservation biology principles that provide for sustainability of species. Following these principles result in the redundancy, resiliency and representation of habitat for species. Across the FNF these conservation principles are being practiced in planning and implementation. These conservation principles are as follows:

1. Species that are well-distributed across their range are less susceptible to extinction than species confined to small portions of their range. One example of how the FNF is meeting this principle is grizzly bear management being addressed at both the bear management subunit (BMU subunit) level with a certain road density and secure habitat goal and the Northern Continental Divide Ecosystem level with frequency of female occupancy. Keeping species well distributed maintains genetic variability and maintains the species across the planning area.

2. Habitat in contiguous blocks is better than fragmented habitat. The theory of island biogeography suggests that fragmentation decreases species richness due to reduced immigration and emigration potential (in the case of isolation) and increased extinction rates. A couple of ways the FNF is reducing landscape fragmentation from anthropogenic activities is by

land acquisition and by attaining the access management goals for grizzly bear management at BMU subunit level and the vast amount of wilderness present on FNF and adjacent forests.

3. Large blocks of habitat containing large populations of species are superior to small blocks of habitat containing small populations. Larger patches will also typically contribute to less fragmentation of populations and act as connectors or corridors across the landscape. The FNF contains some of the largest parcels of connected wilderness in the lower 48 states with the Bob Marshall Wilderness complex and adjacent roadless areas.

4. Blocks of habitat close together are better than blocks far apart. Patches of habitat that are closer together will experience more interchange of individuals than patches that are far apart. When interchange occurs between habitat patches they are united into a larger metapopulation that is less vulnerable to extirpation. Implementation of the land acquisition program, access management for grizzly bears and management of wilderness and roadless areas are examples of the FNF practicing this conservation principle.

5. Interconnected blocks of fragmented habitat are better than isolated blocks. Connectivity has become one of the most widely accepted conservation planning principles. Connectivity provides the opportunity for species to move between patches that contain suitable habitats with less vulnerability. Conservation biologists typically agree that habitats connected by natural movements of species are less subject to extirpation than habitats artificially isolated due to human development management. Land acquisition in the Swan Valley was prioritized for the value towards grizzly bear connectivity. Riparian and old growth management maintain connectivity within FNF that are not connected by large blocks of roadless or wilderness. The FNF is well connected with Canada, Glacier National Park and the Kootenai, Lewis and Clark, Helena, and Lolo National Forests, as well as the Flathead Indian Reservation Wilderness and forest lands, and the forested matrix of state and private industrial forest lands.

6. Blocks of habitat that are in areas where the direct or indirect effects of human disturbance are low are more likely to provide all elements of species' source environments. The FNF is comprised of 69% wilderness, proposed wilderness, and inventoried roadless lands.

To maintain landscape connectivity and resiliency on the FNF, since the mid-1990s secure habitat for grizzly bears has improved from 63% to 70%, open road density has decreased by over 1,500 miles to only 0.4 miles per square mile, about 682 miles of system road has been decommissioned, upsizing and correcting culverts for aquatic species passage has occurred, an active fuels reduction and prescribed fire program has returned thousands of acres back to a less risky state for unplanned wildfire, over 52,100 acres of habitat has been acquired that will not be converted to residential lands, and an active invasive plant and animal management program occurs. These actions help to reduce the effects of human caused habitat fragmentation and promote north to south connected landscapes to enable dispersal and migration, recolonization, and genetic exchange; prevent and control the spread of invasive species; maintain and restore ecosystems for terrestrial and aquatic species and, reduce the potential negative physiological and behavioral responses by grizzly bears and many other wildlife species.

Key sources of uncertainty

Generating reliable climate change predictions on effects to terrestrial wildlife is hindered by:

- Variability in physical climate systems (IPCC 2007; Karl et al. 2009);
- Uncertainty in vegetative community shifts (Dale et al. 2001; Root et al. 2003; Bilby et al. 2007; Brown et al. 2008; Janetos et al. 2008; Joyce et al. 2008);
- Interactions between climate and non-climate stressors, and between biotic and abiotic ecosystem components (Root et al. 2003; Parmesan 2006; Bilby et al. 2007; Brown 2008; Janetos et al. 2008; Joyce et al. 2008; Karl et al. 2009);
- Variation in life history strategies, physiological tolerance, and dispersal abilities (Root et al. 2003; Parmesan 2006; Bilby et al. 2007; Janetos et al. 2008);
- Missing information on species-level responses (Root et al.2003; Parmesan 2006; Bilby et al. 2007; Janetos et al. 2008);
- Species interactions (e.g, competition, predation) (Root et al. 2003; Parmesan 2006; Bilby et al. 2007; Suttle et al. 2007; Janetos et al. 2008);
- Influence of invasive and exotic species (Root et al. 2003; Parmesan 2006; Bilby et al. 2007; Janetos et al. 2008);
- Inadequate monitoring systems to document changes (GAO2007); and,
- Climate and vegetation model constraints on scale and accuracy.

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